



How to build your robot

www.pib.rocks/build

assembly instructions for:

Upper Body

pib#4 research



PRINT

BUILD

DEVELOP

YOUR OWN ROBOT

Printable parts

Printable parts

4 x **B48**-Hinge

2 x **B49**-Hinge_Plate

B51S-Servo_Array_Scaffold

B55-Logo_edu

2 x **B56**-Speaker_spring

2 x **B57**-Printed_washers

B47-Power_holder

B58-Button_scaffold

Printable parts

B19-Flat_stand_right

B20-Flat_stand_left

7 x **B25**-Wire_connector

6 x **B26s**-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

B45s-Electronics_base

B46-Power_back

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

4 x **E17**-Waveshare_servo_driver

14 x **E27**-STS3215

1 x **E16**-RPi Power Supply

3 x **E25**-RGB buttons

2 x **E26**-Speakers

1 x **E24**-Relay

78 x **S01** M3 nuts

56 x **S03** M3 8 mm screws

26 x **S04** M3 10 mm screws

20 x **S05** M3 12 mm screws

8 x **S06** M3 16 mm screws

22 x **S08** M3 20 mm screws

2 x **S09** M3 22 mm screws

4 x **S10** M3 25 mm screws

2 x **S11** M3 30 mm screw

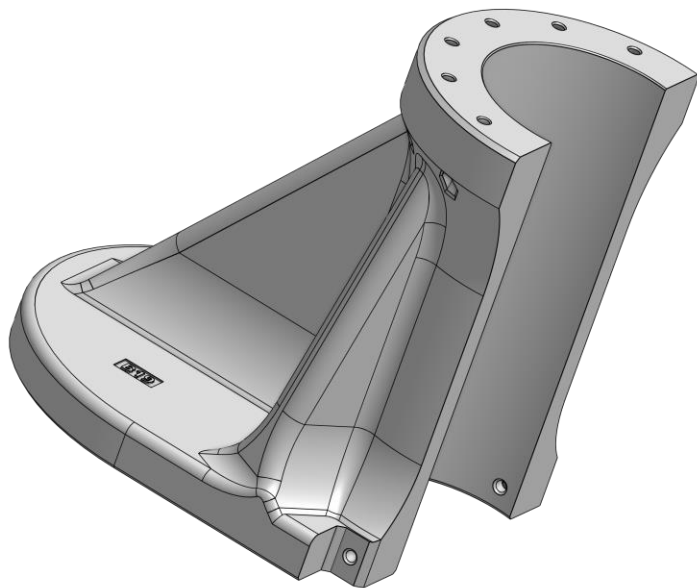
12 x **S13** M3 40 mm screws

4 x **M08** 20 mm metal rods

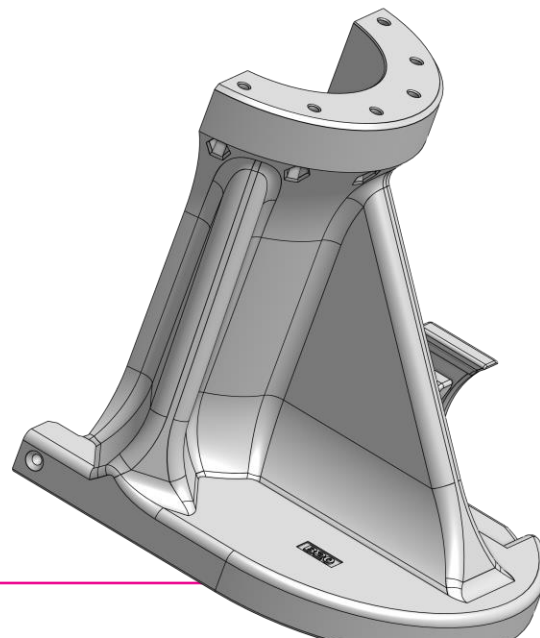
14 x **M18**

Printable parts - Overview

B19-Flat_stand_right

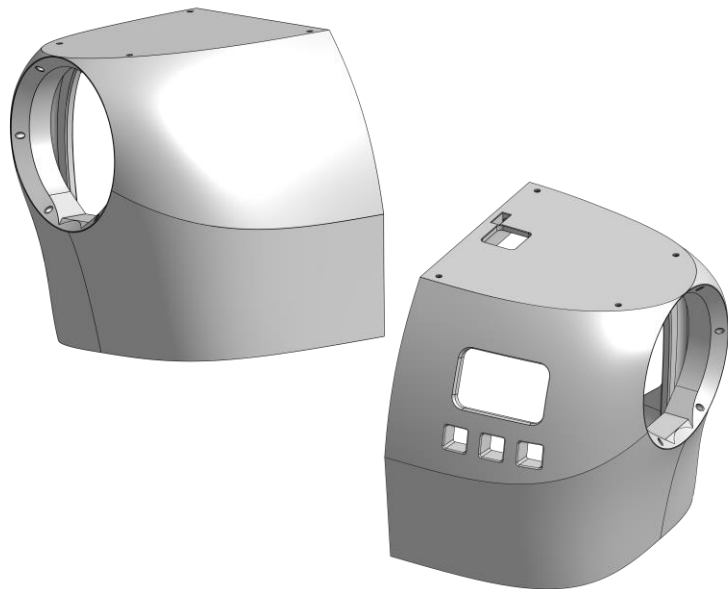


B20-Flat_stand_left



Printable parts - Overview

B41-L/-R-Clavicle_Left/Right

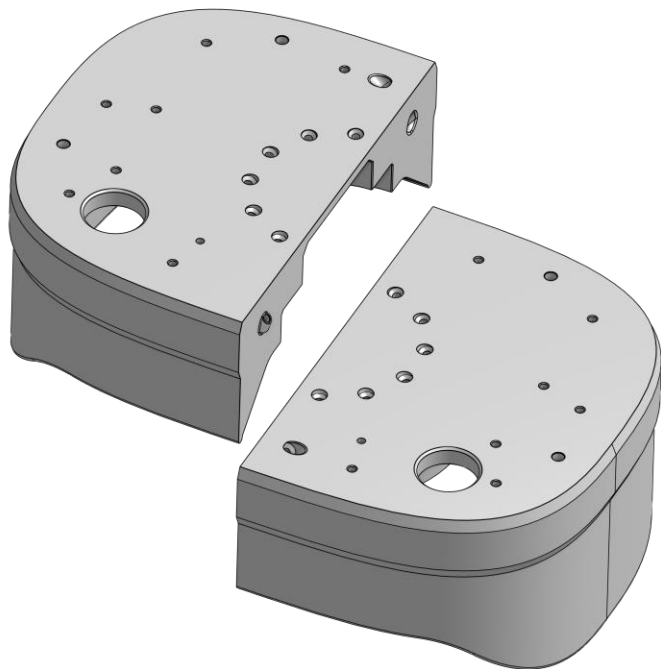


B42-L/-R-Ripcage_Left/Right

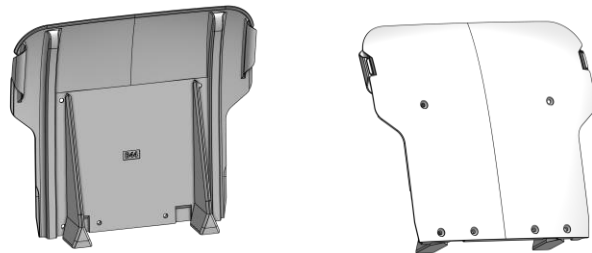


Printable parts - Overview

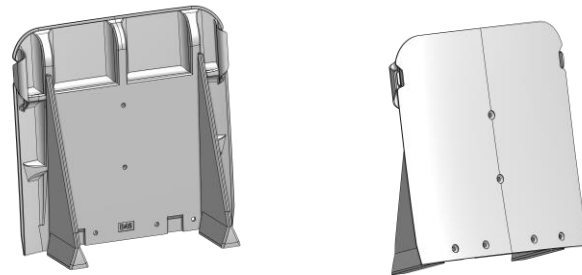
B43-L/-R-Ripcage_Lower_Left/Right



B44-Electronics_back

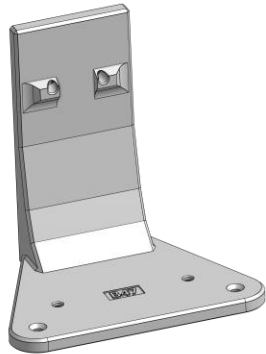


B46-Power_back

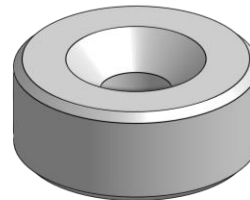


Printable parts - Overview

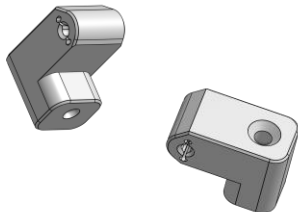
B47-Power_Holder



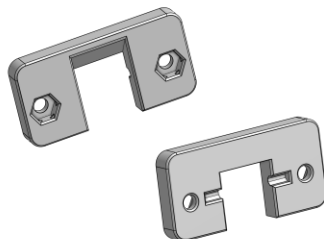
B57-Printed_washer_relay



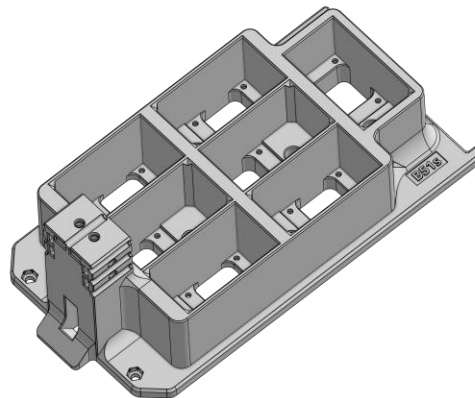
B48-Hinge



B49-Hinge_Plate

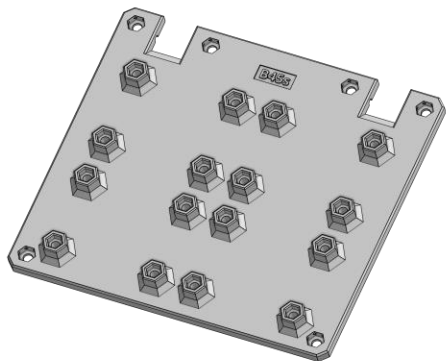


B51s-Servo_Array_Scaffold



Printable parts - Overview

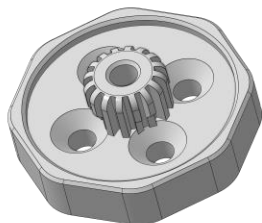
B45s-Electronics_base



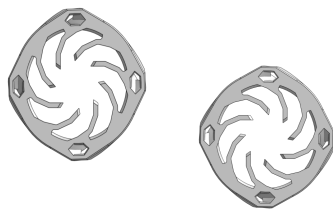
B27-Wire_connector_mount



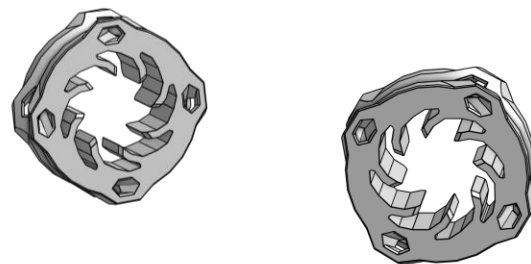
B25s-Wire_connector



B26-Wire_connector_pawl



B31-Wire_connector_pawl_forearm



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

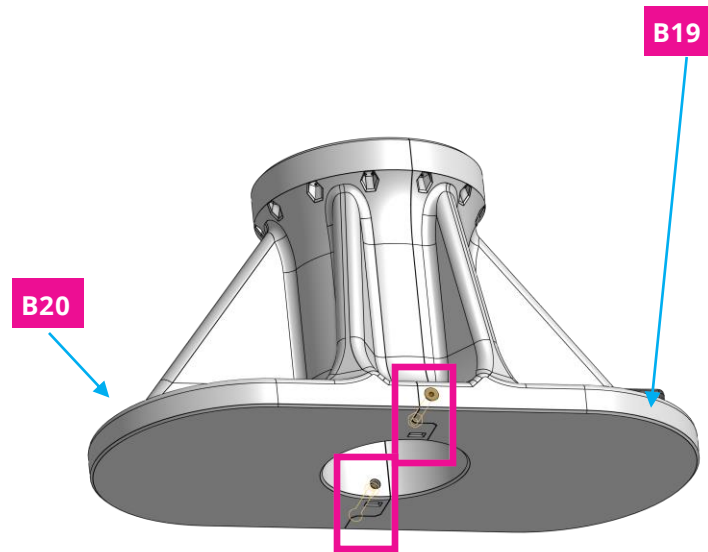
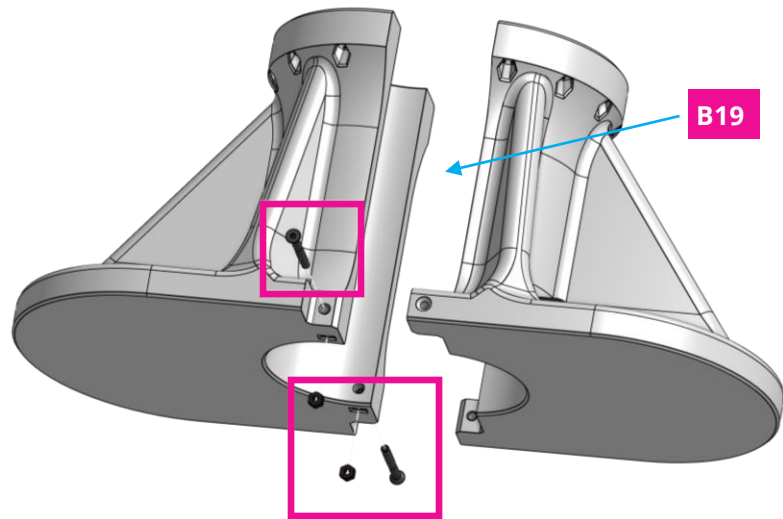
Step 0

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



Step 1

Place **2 x nuts** in the shown spots in **B19**, then use **2 x 30 mm screws** to fix **B20** to **B19**.

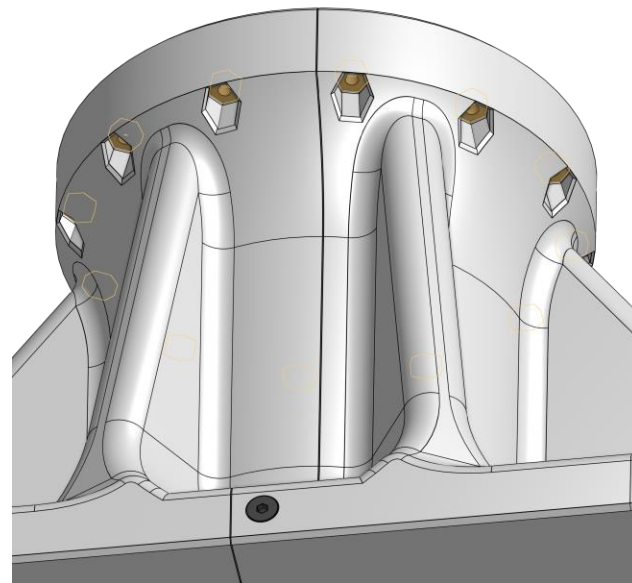
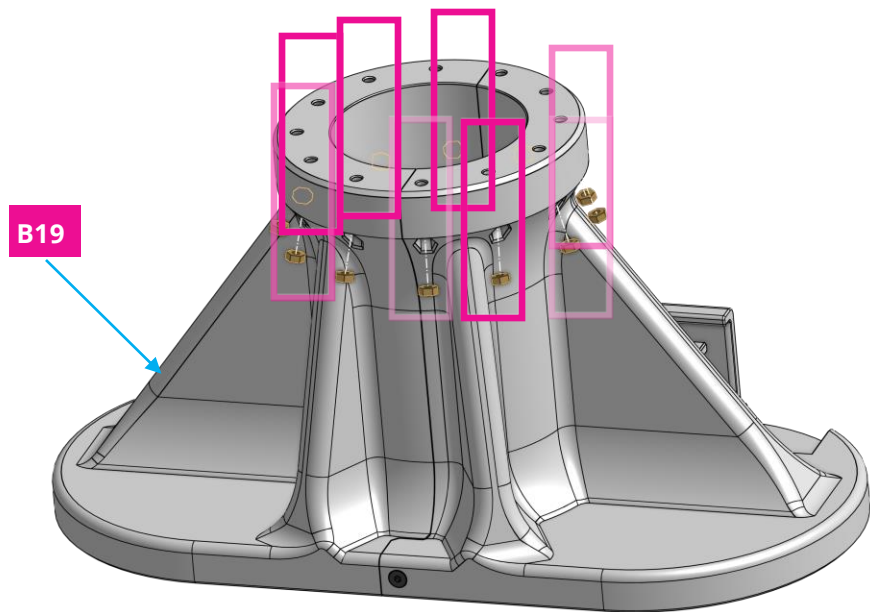


Step 2a

Place **12 x nuts** in shown spots in **B19** and **B20**.



6x

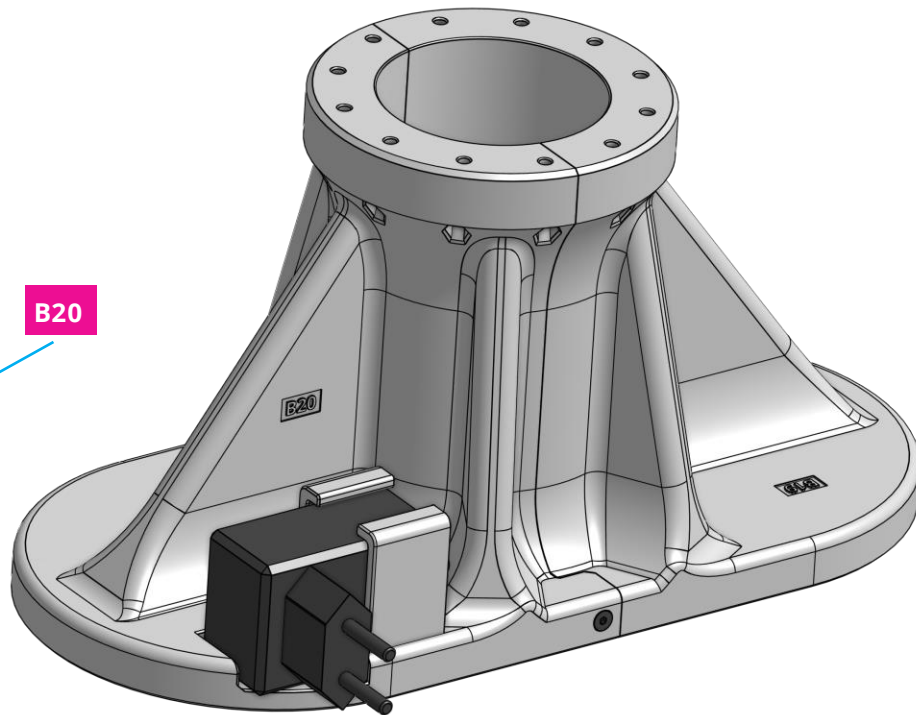
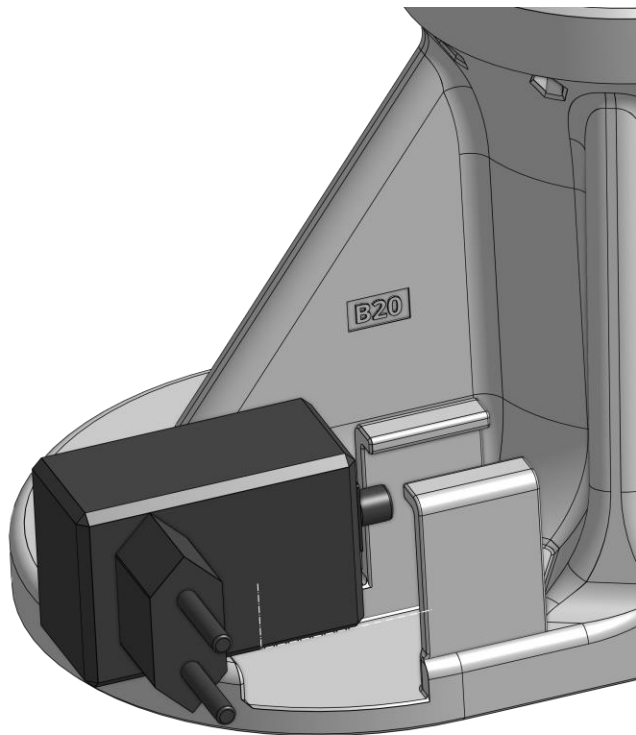


B20

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

Step 2b

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

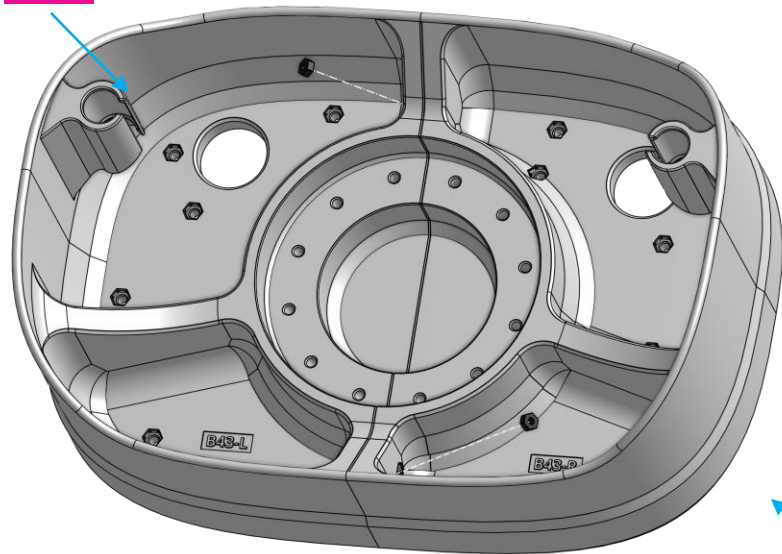


Step 3a

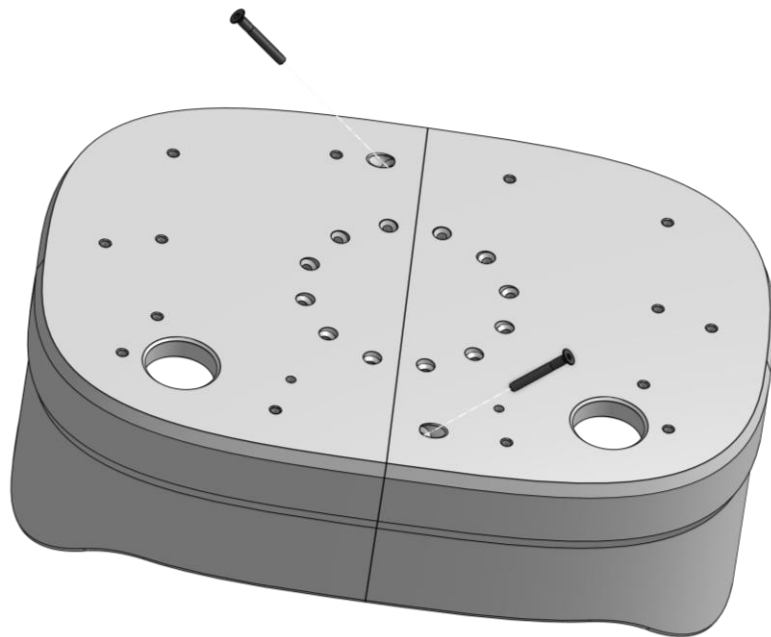
Connect **B43-L** and **B43-R** using **2 x M3 nuts** and **2 x M3 25mm screws**.



B43-L



B43-R



Step 3b

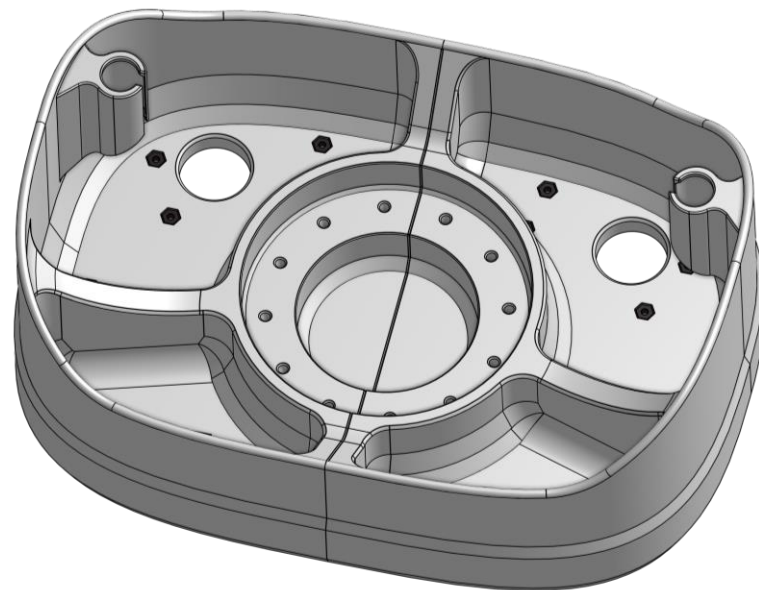
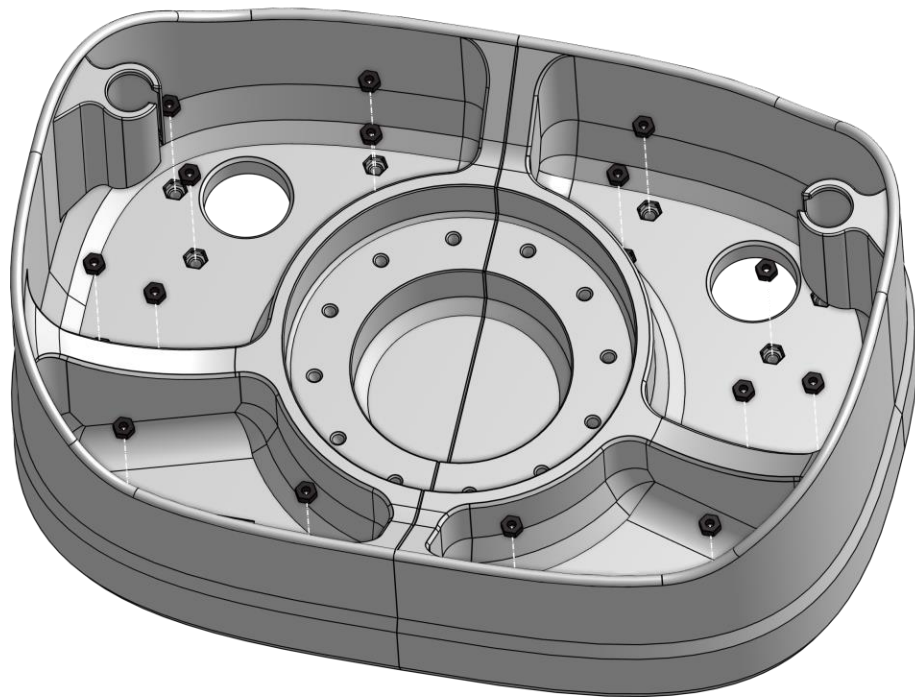
Place **16 x M3** nuts in the assembly.



2



16x



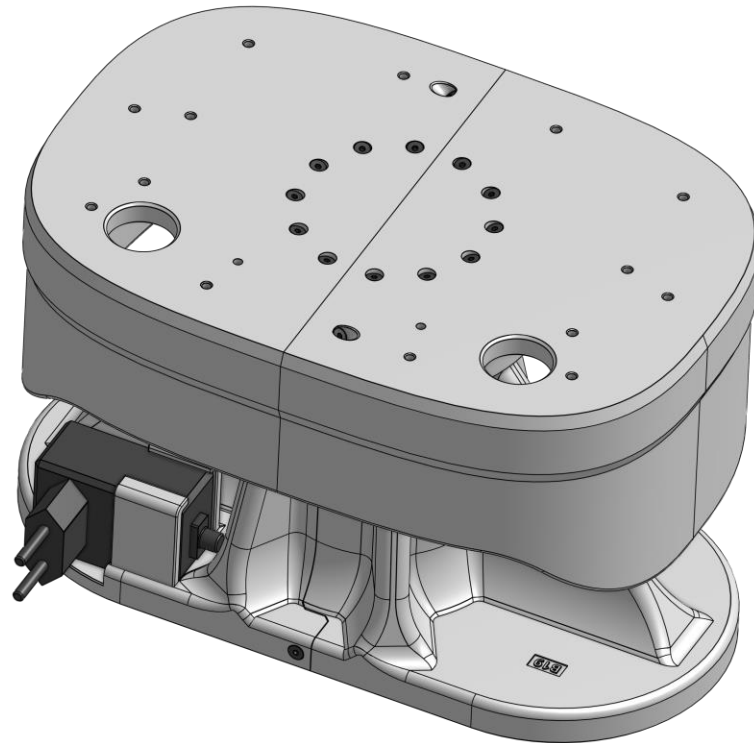
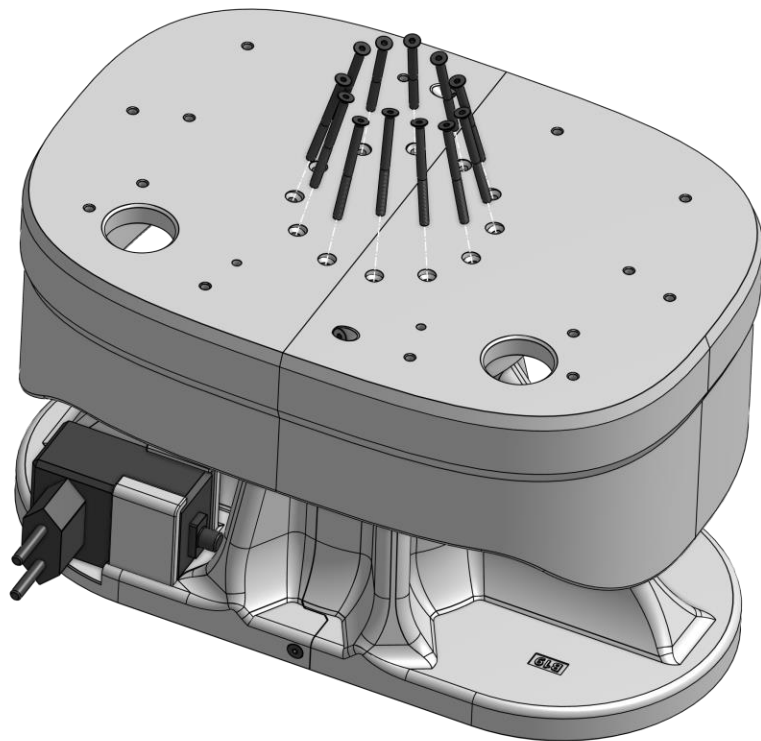
Step 4

Connect both assemblies using **12 x 40 mm screws**.

You may apply some gentle force to connect the assemblies.

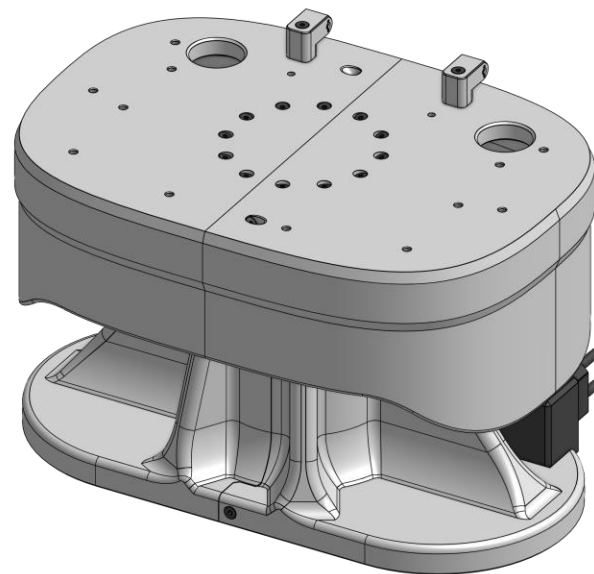
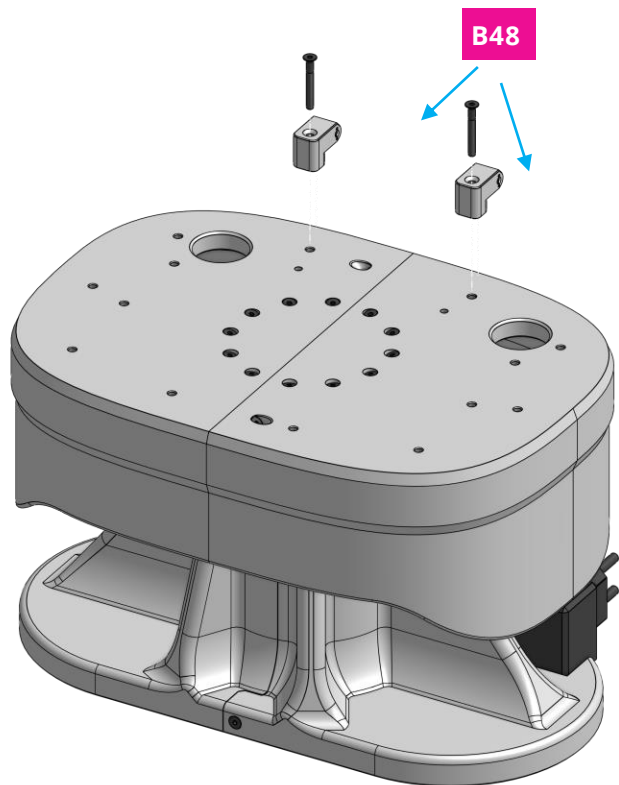


12x



Step 5

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



Step 6a

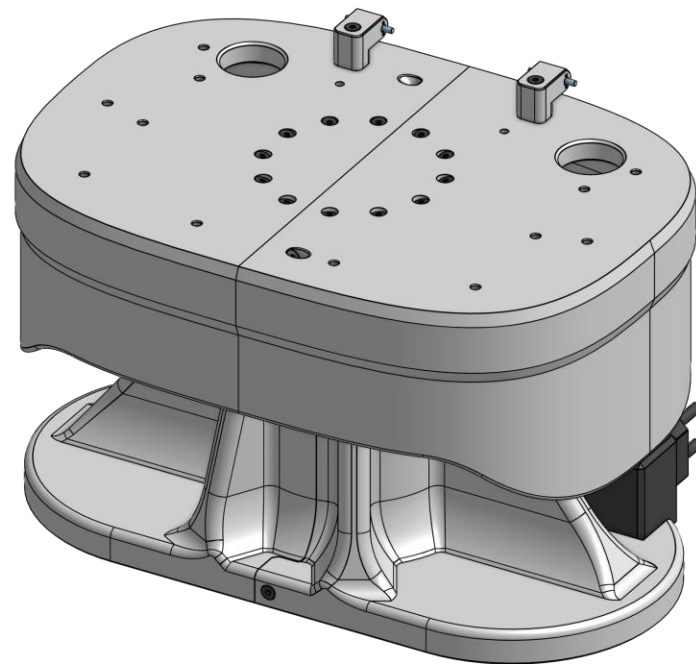
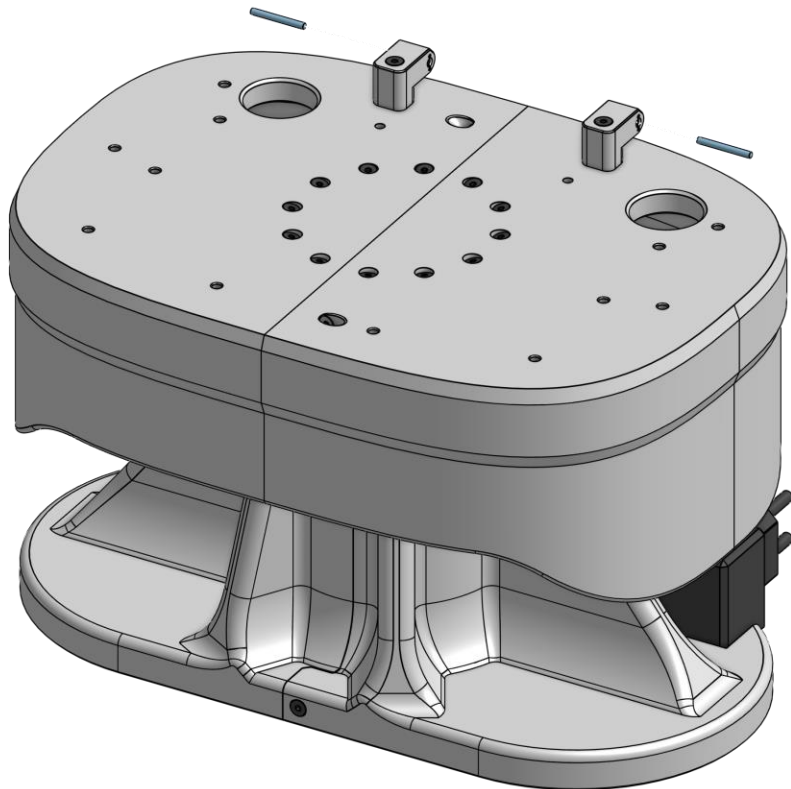
Insert 2 x **M08** to both **B48**.



2

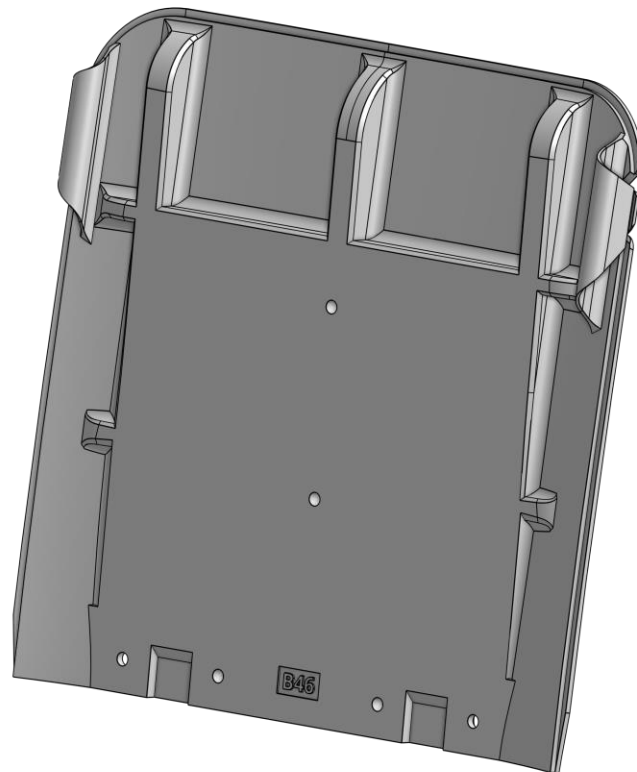
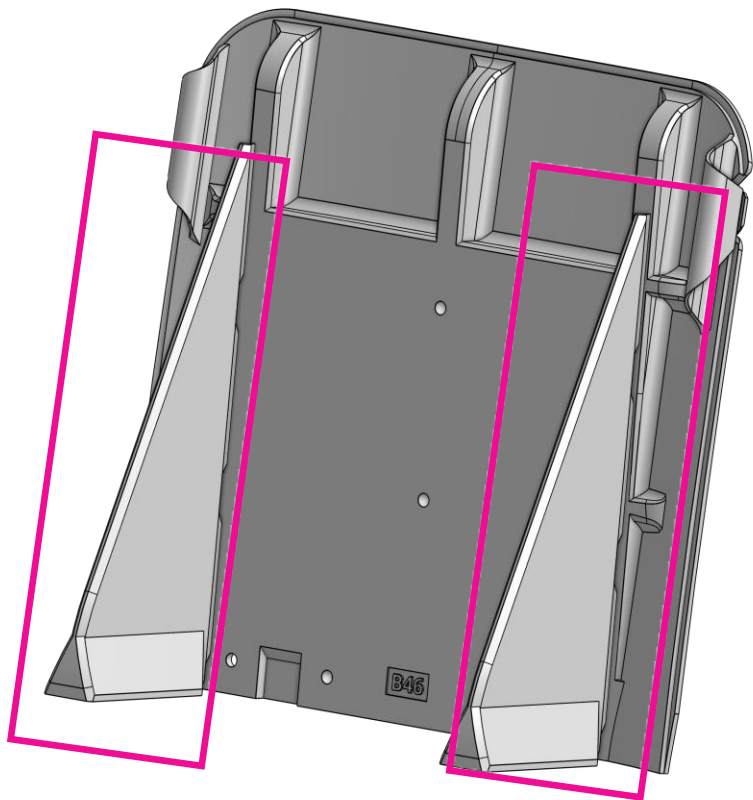


2x



Step 6b

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**.



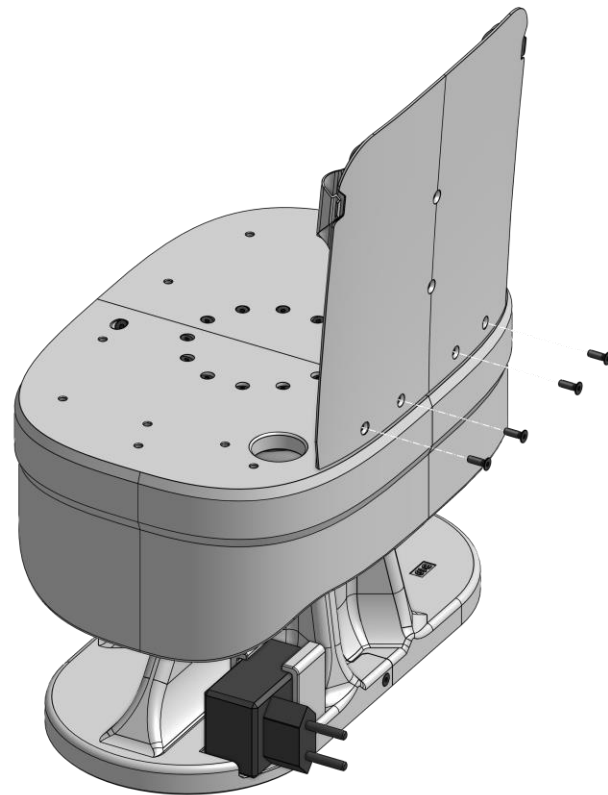
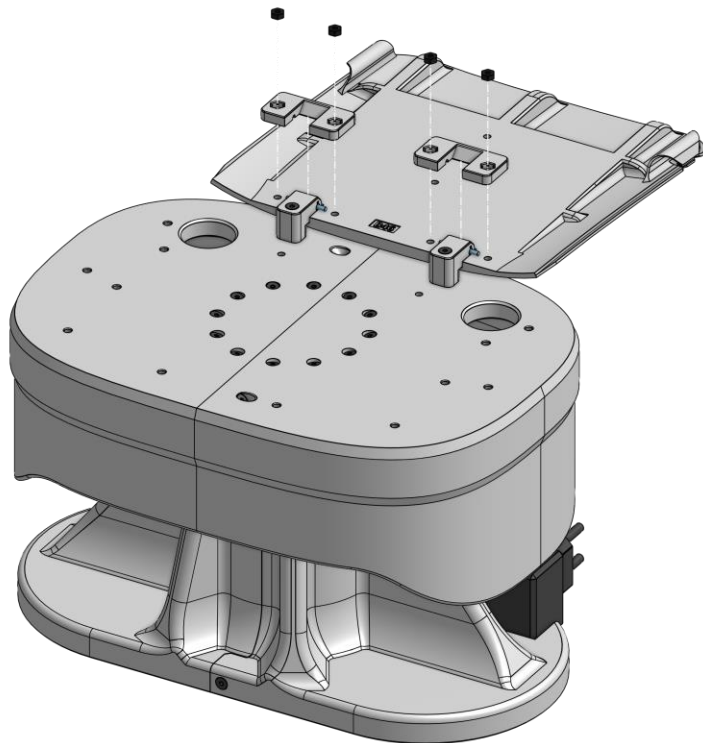
2



4x



4x

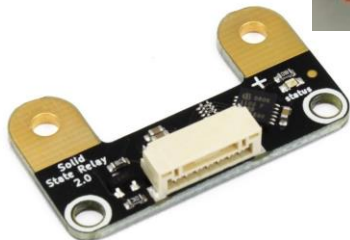


Step 8a

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



solid state relay



solid state relay
bricklet



Step 8b

Connect **B47** to **B43-L** and **B43-R** using **4 x M3 nuts** and **2 x M3 16mm screws**.



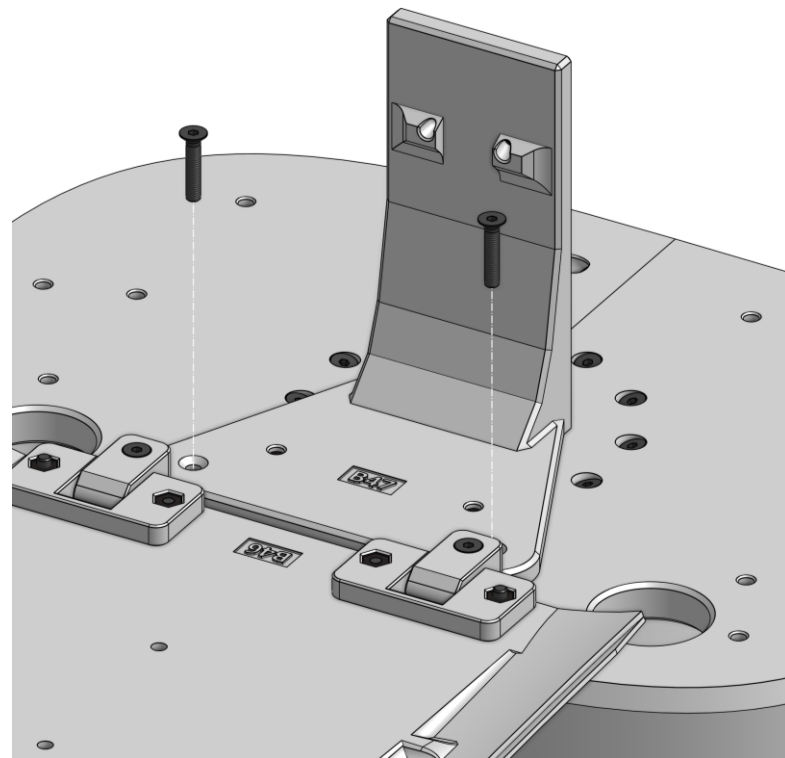
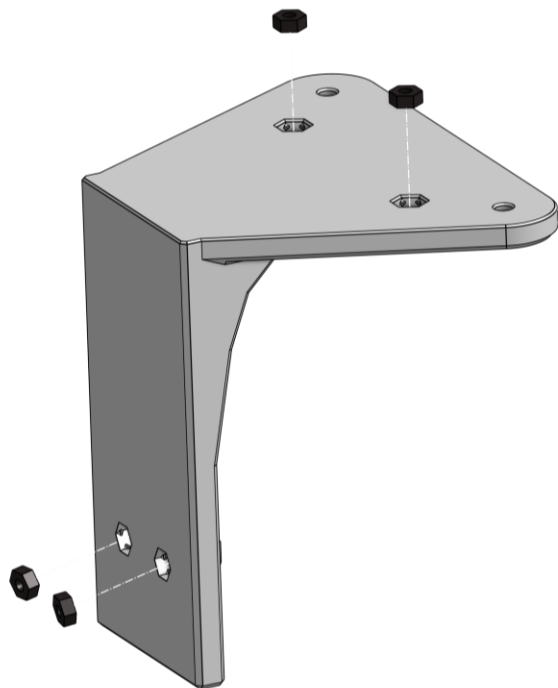
2



4x

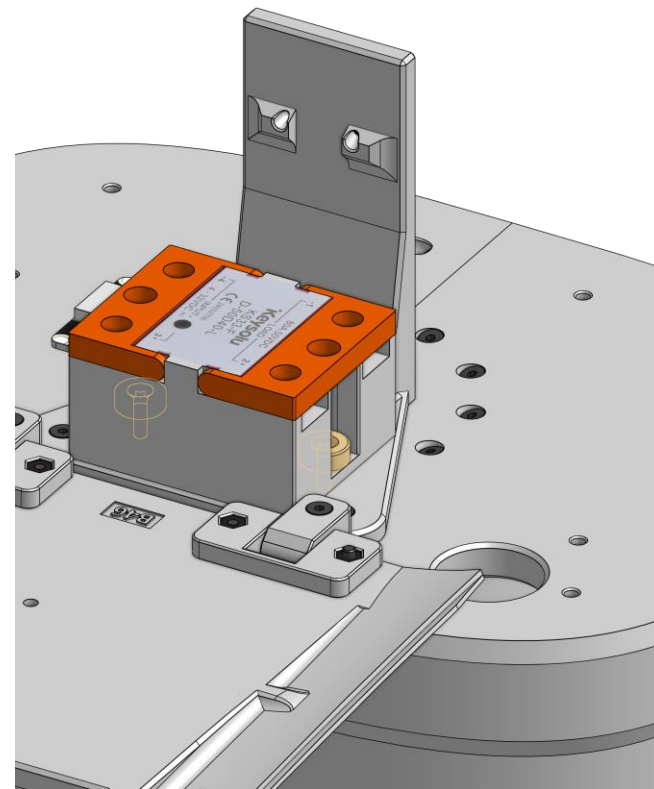
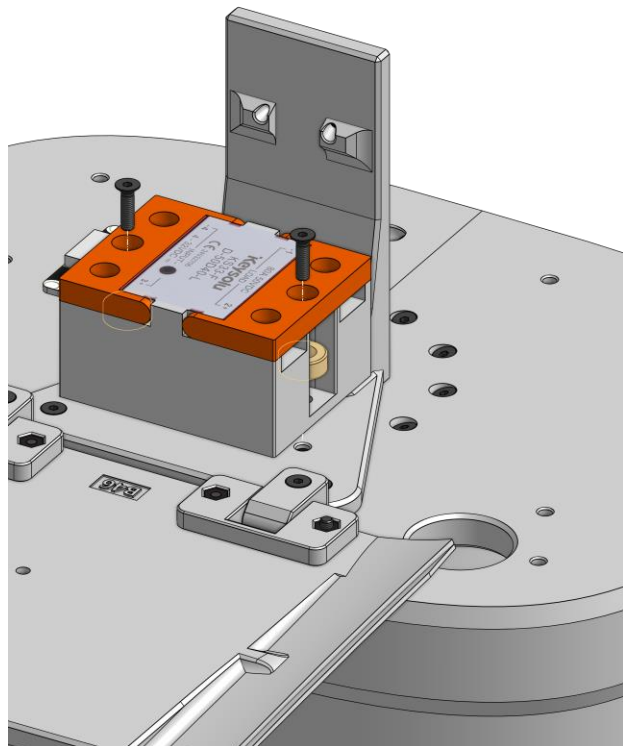


2x



Step 8c

Connect **E16** to **B43-L** and **B43-R** using **2 x B57** and **2 x M3 12mm screws**.



2



2x

Step 8d

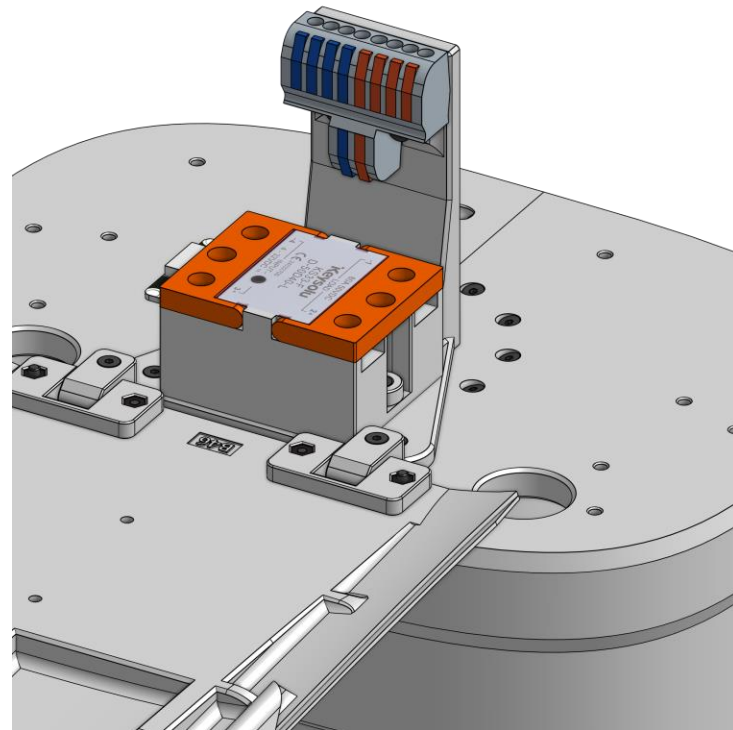
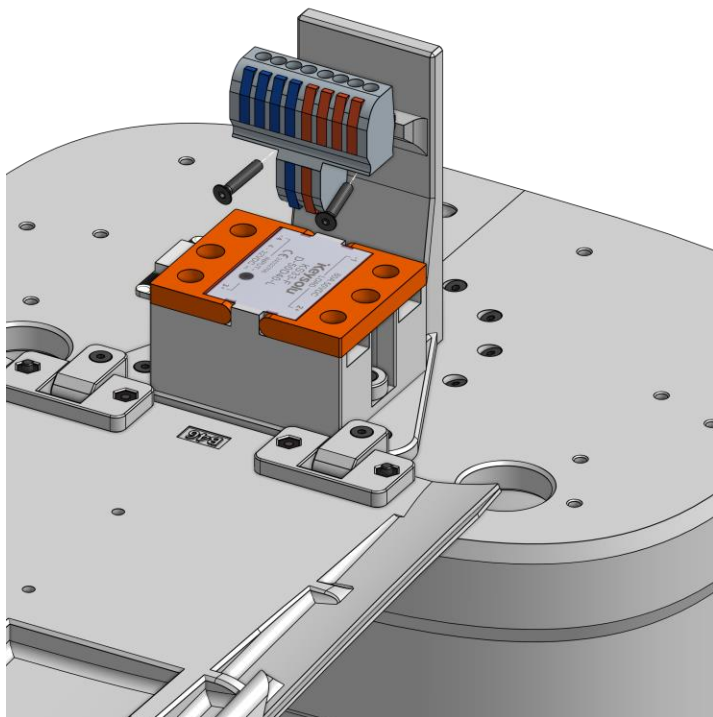
Connect **E13** to **B47** using **2 x M3 16mm** screws.



2



2x



Step 9a

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



2

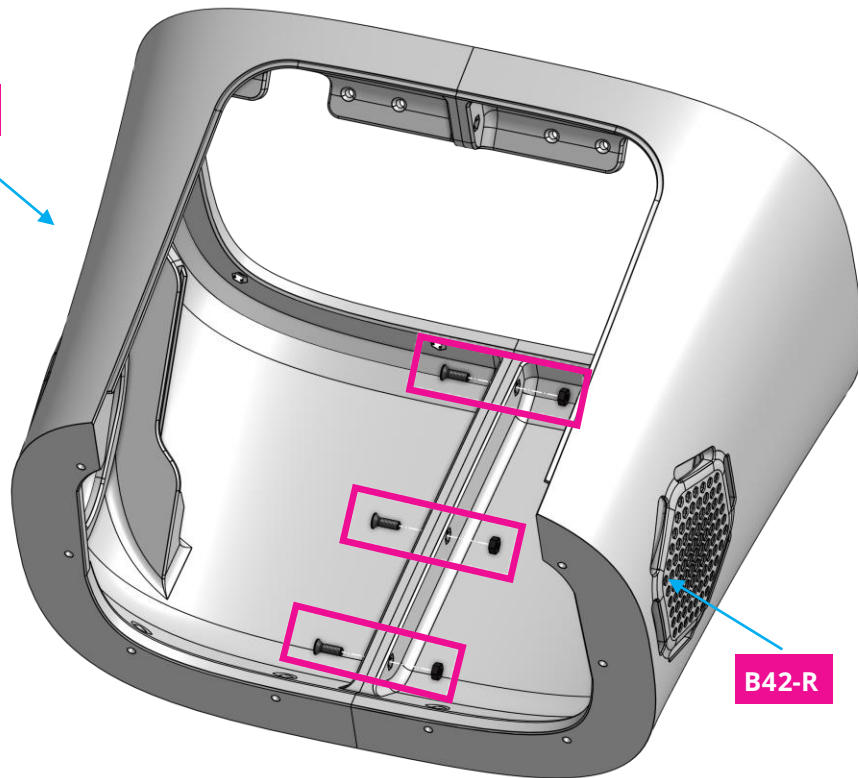


3x

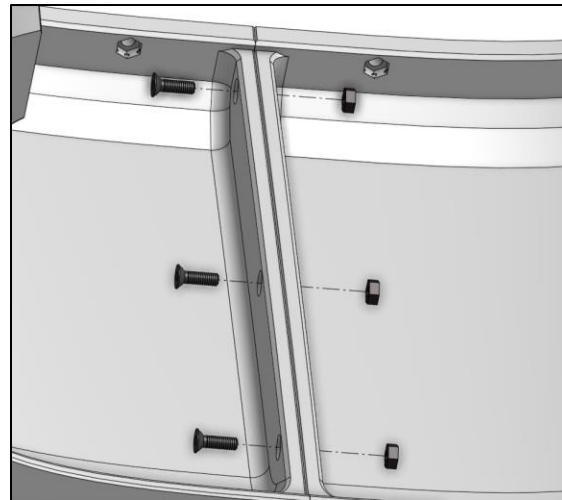


3x

B42-L

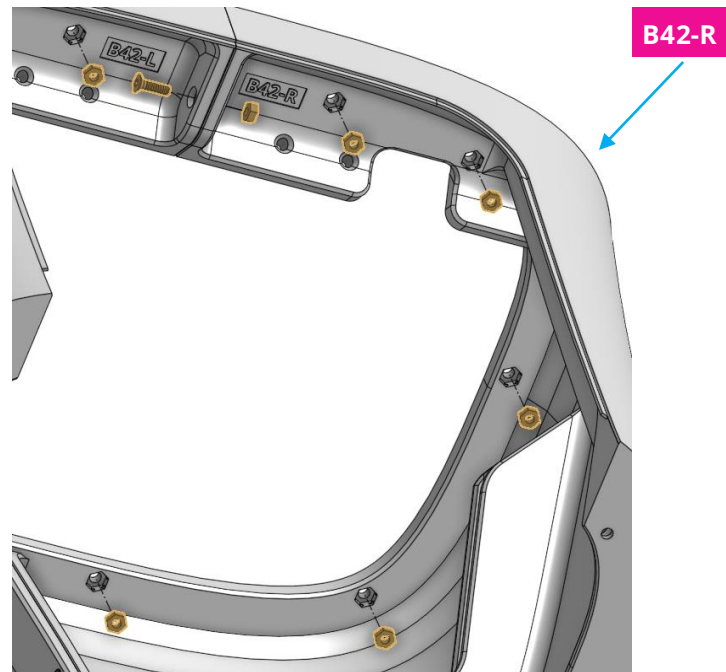
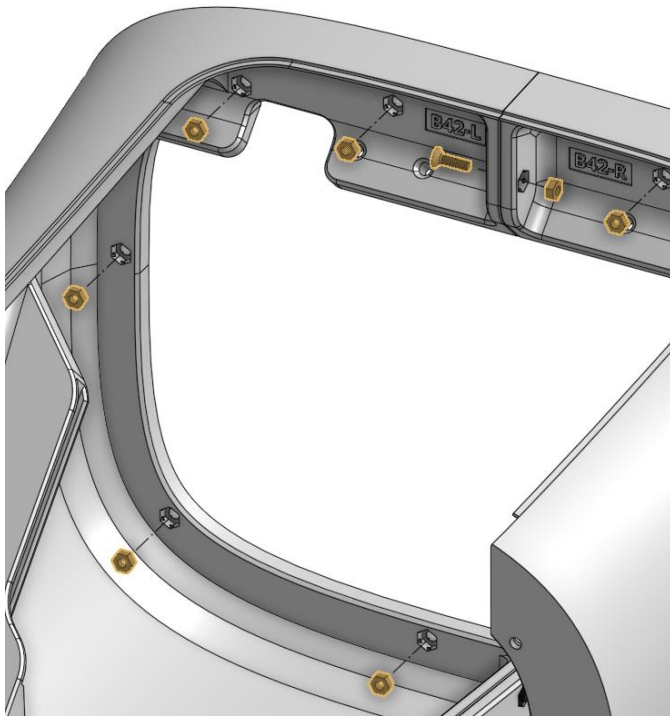


B42-R



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**.



Step 9c

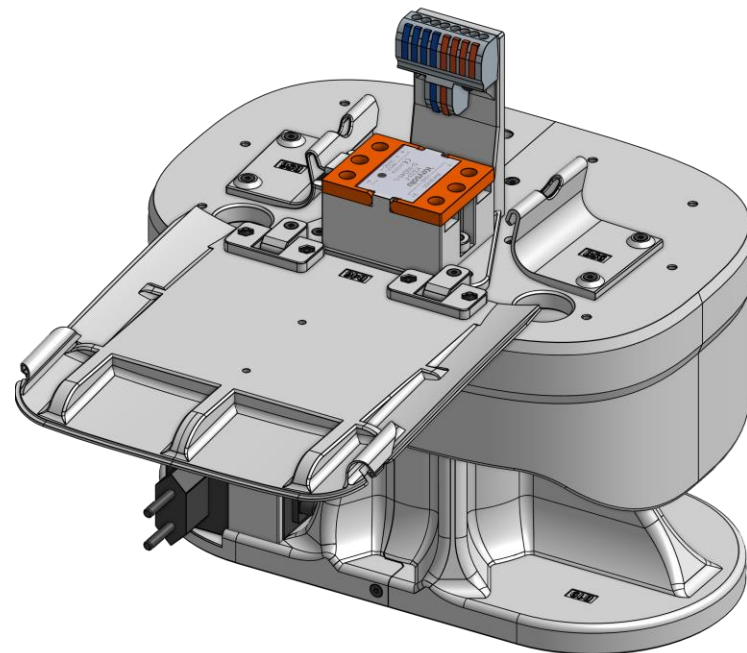
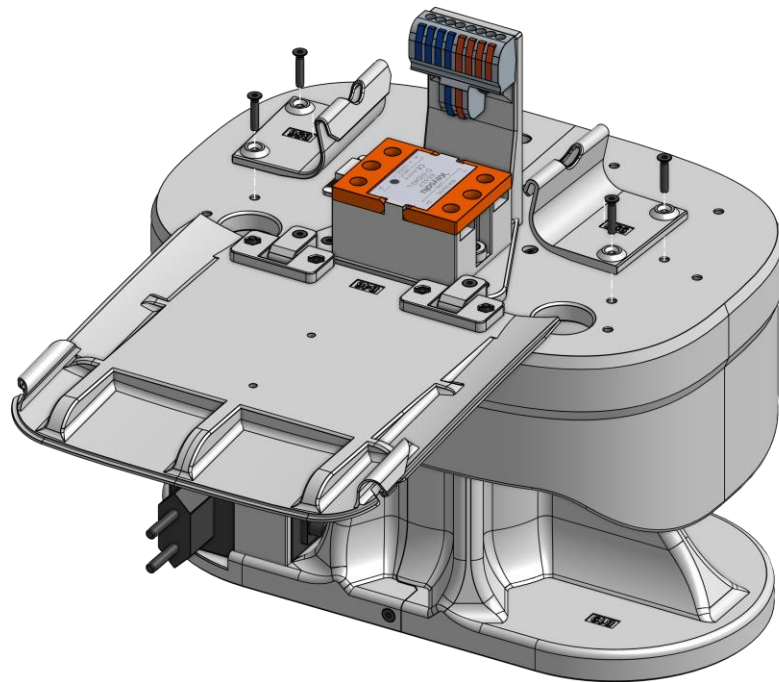
Connect **2 x B56** to assembly with **4 x M3 16mm** screws



2



4x

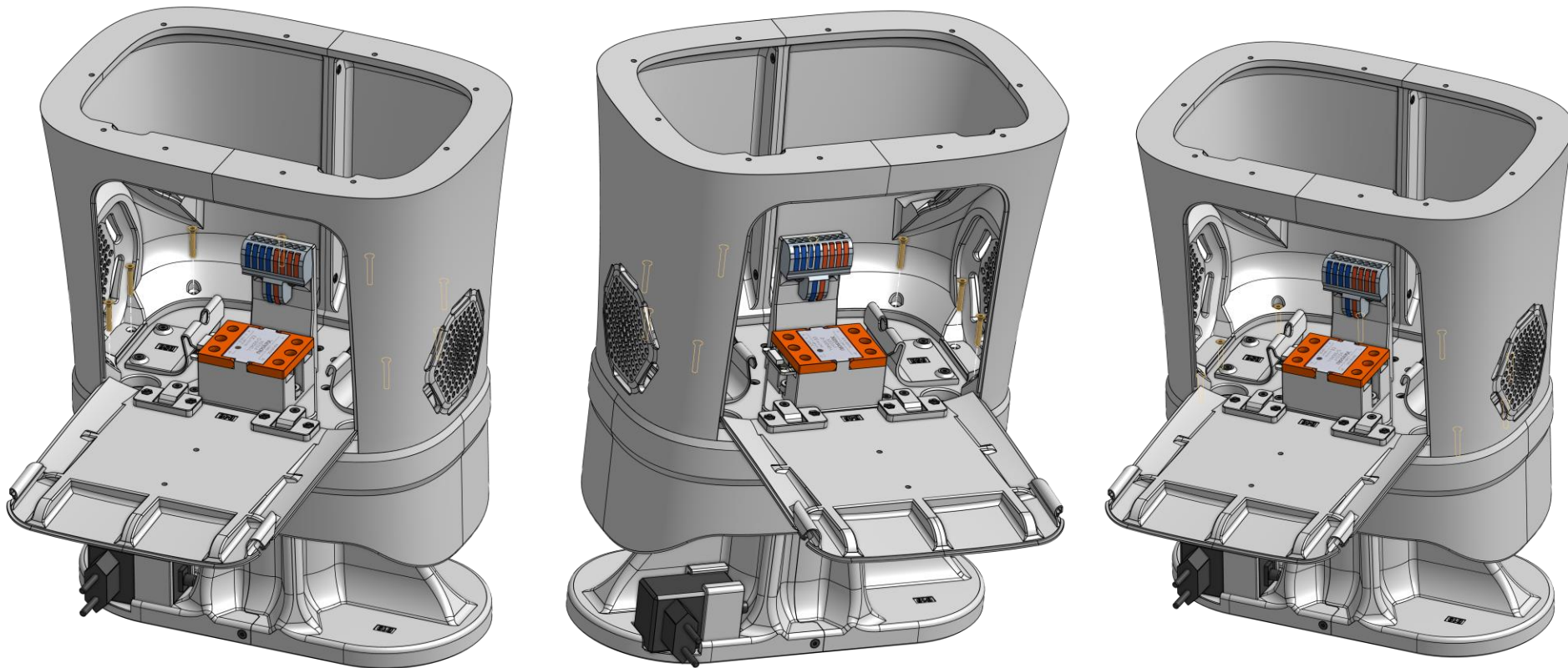


Step 9d

Connect ribcage (previous assembly) to assembly with **8 x M3 20mm screws**.

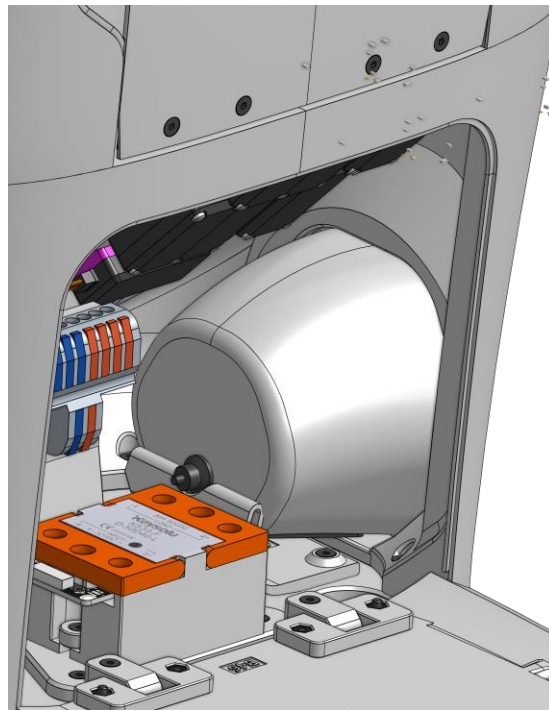
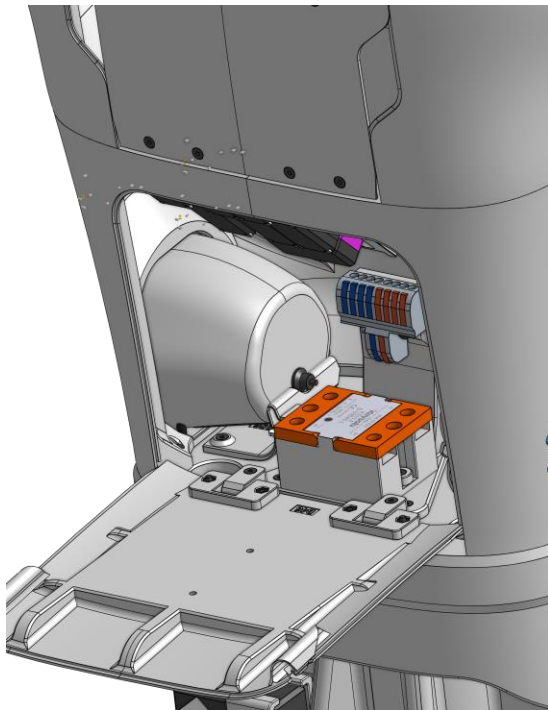
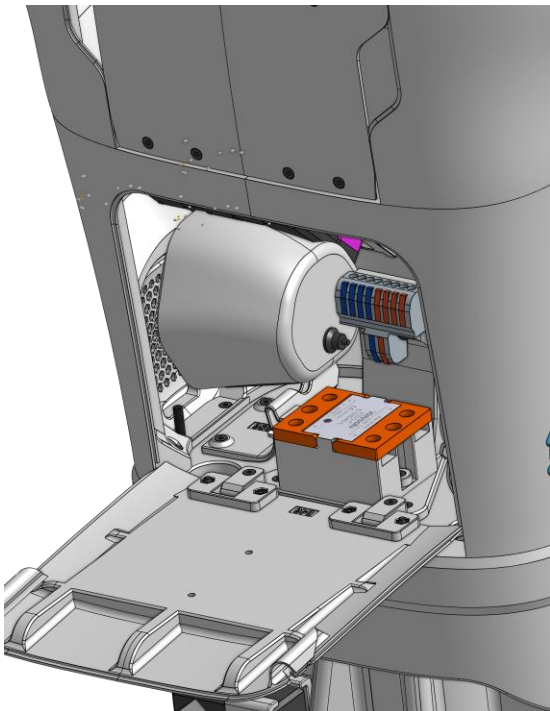


8x



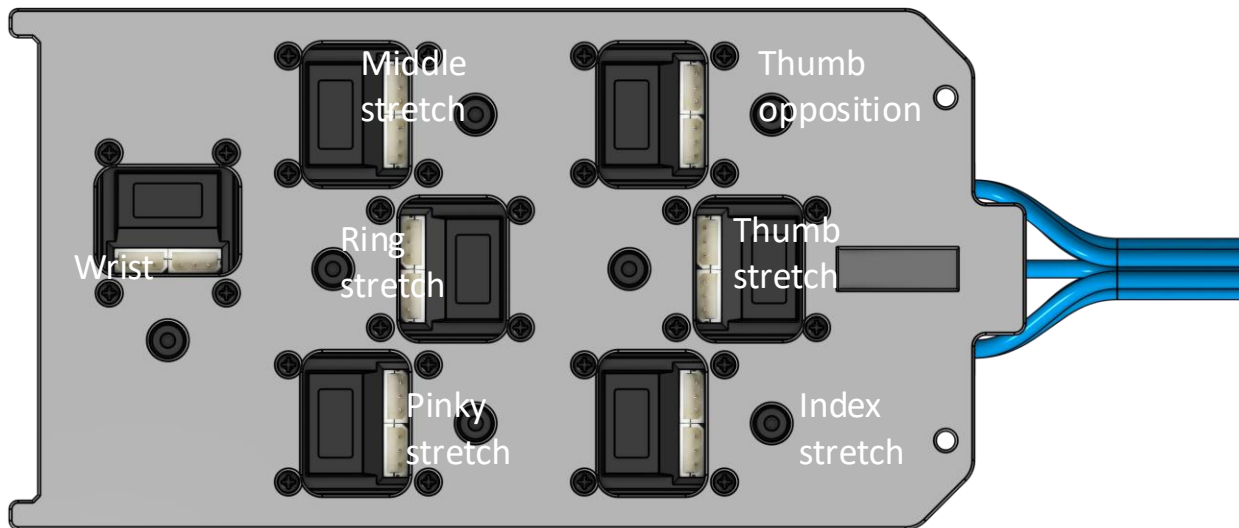
Step 9e

Connect **2 x E26-Speakers** to **B42-L** and **B42-R**



Note

These are the motor names according to the configuration and shown which motor connects to which joint

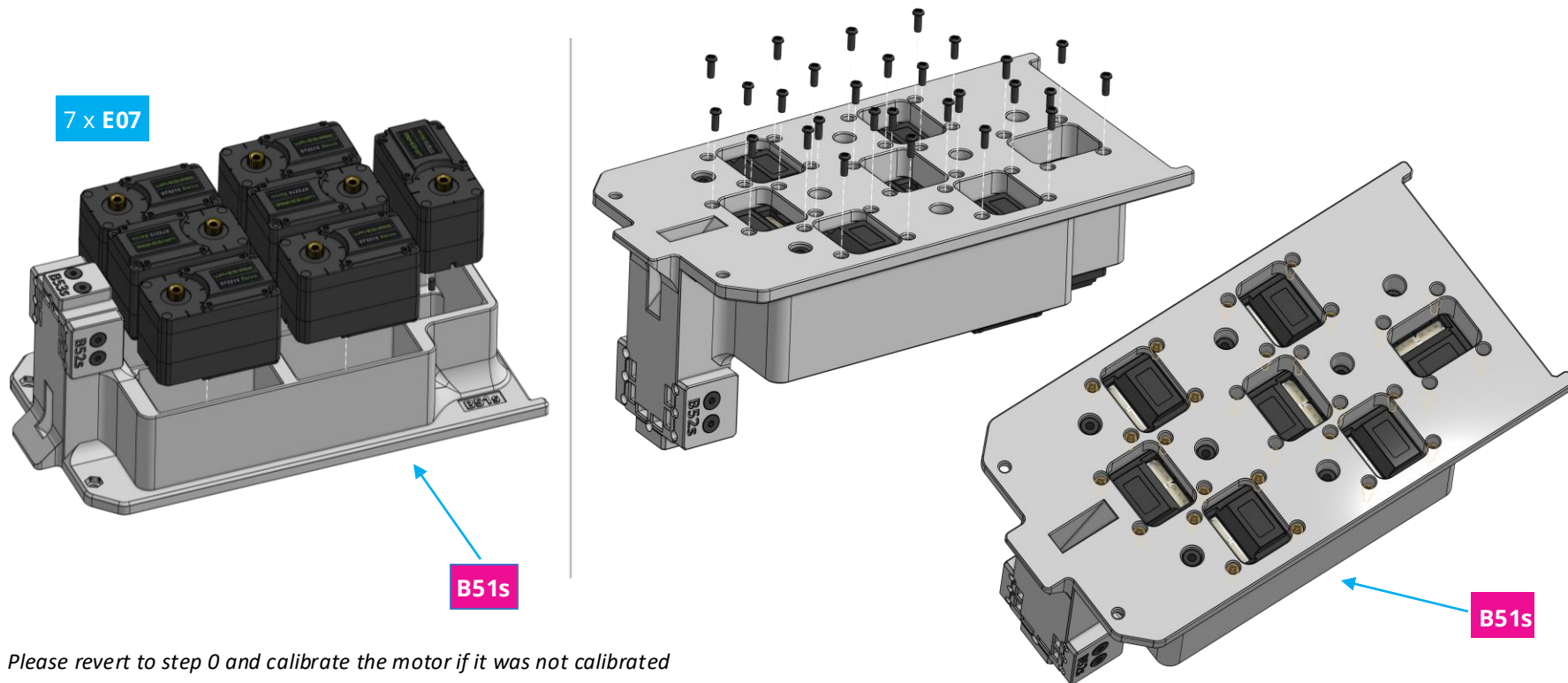


Step 10a

Assemble 7 x **E27** motors in **B51s** using 28 x **M2 6mm** screws.



24x



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

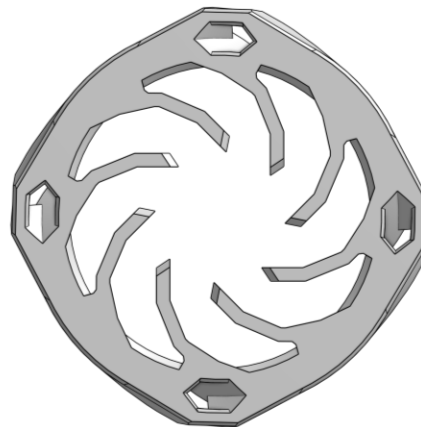
Note

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

Clockwise (CW)



Counter clockwise (CCW)



Step 10b

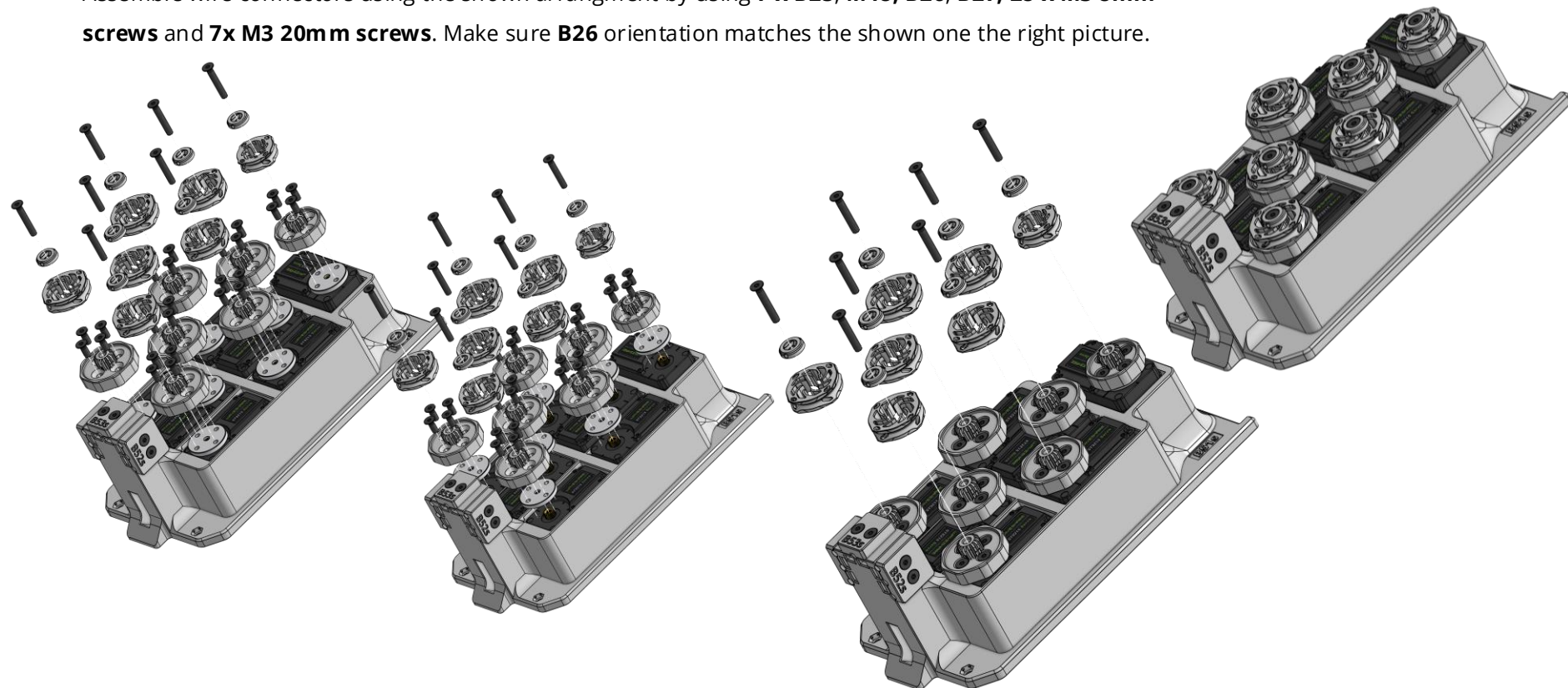
Assemble wire connectors using the shown arrangement by using **7 x B25, M18, B26, B27, 28 x M3 8mm screws** and **7x M3 20mm screws**. Make sure **B26** orientation matches the shown one the right picture.



2



35x



Step 10b

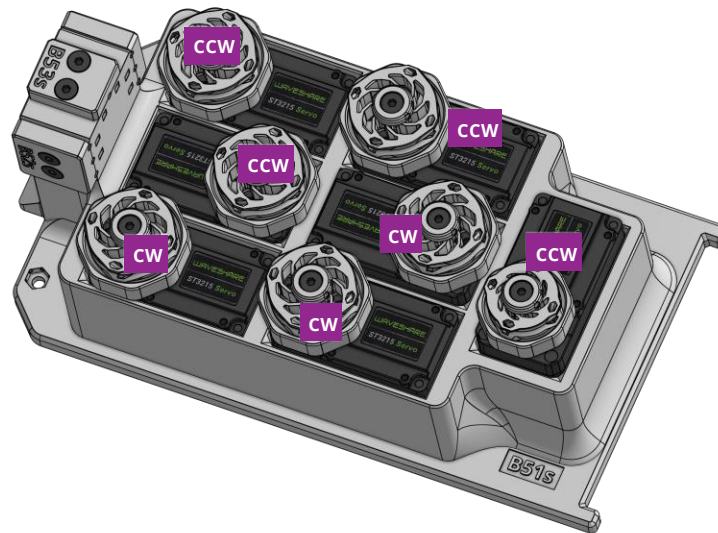
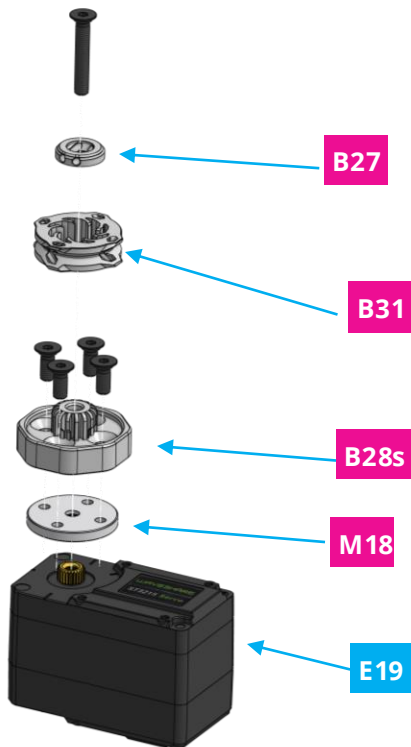
Assemble wire connectors using the shown arrangement by using **6 x B25, B26, B27** and **6x M3 20mm screws**. Make sure **B26** orientation matches the shown one the right picture.



2



5x



Step 10c

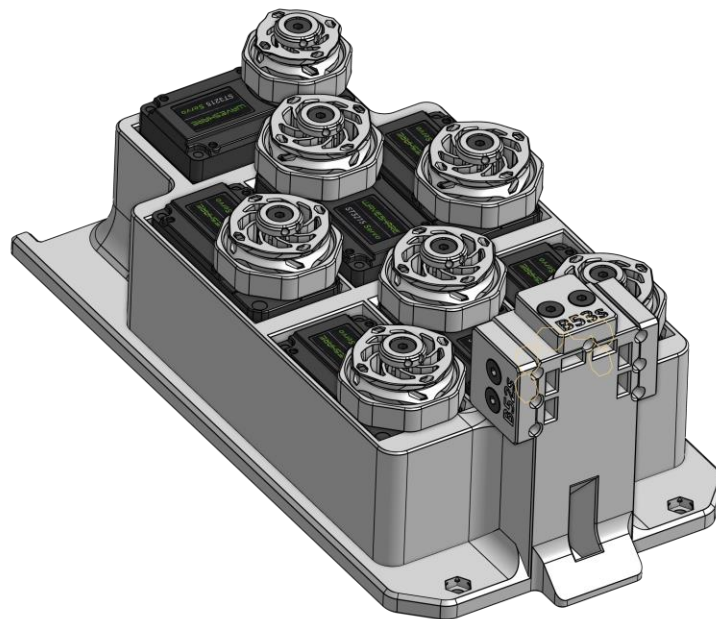
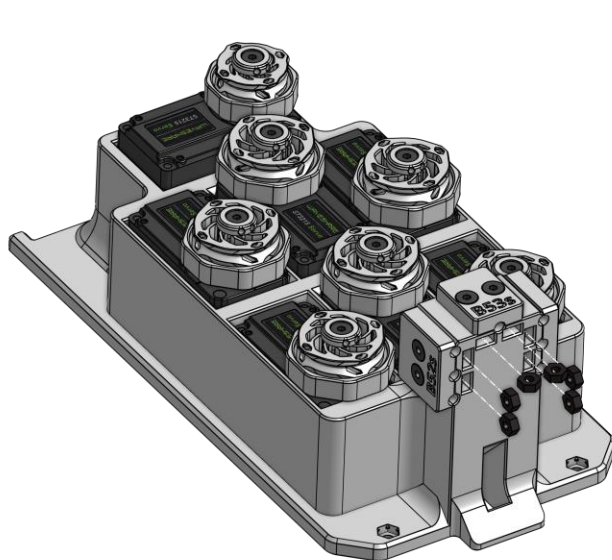
Insert 6 M3 nuts in the shown spots in **B51s**



2



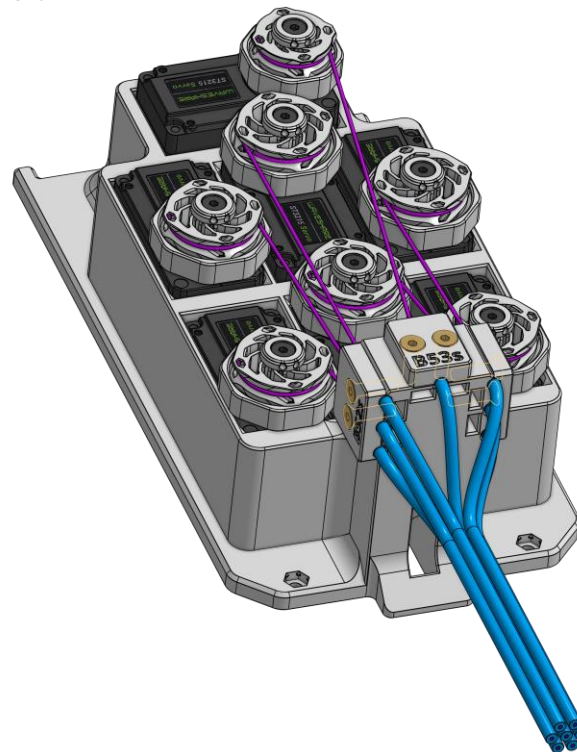
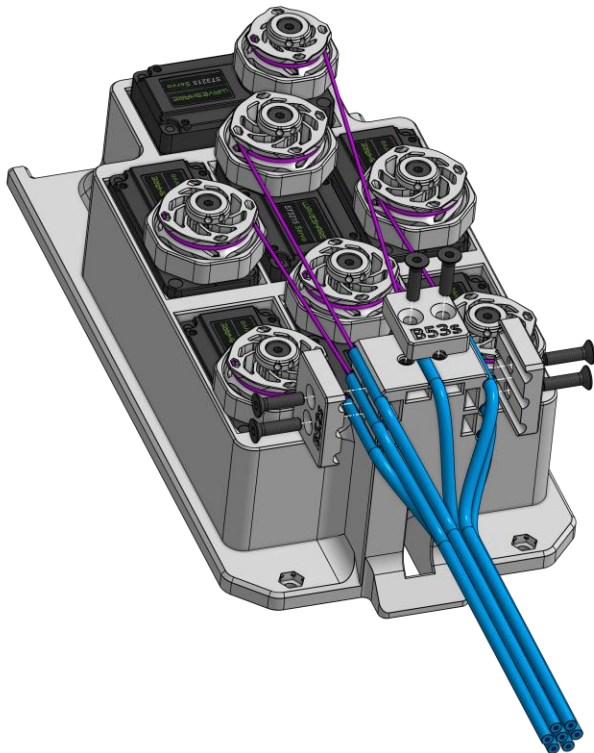
6x



Step 10d

Insert the **teflon tubes** from forearm through the shown spots and use **6 x 12 mm** to fix them.

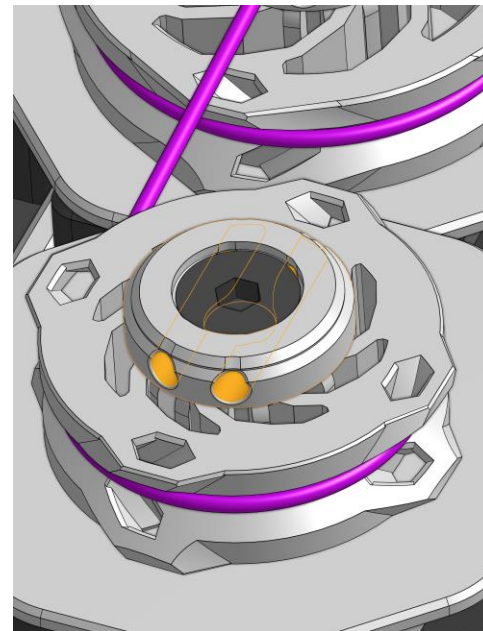
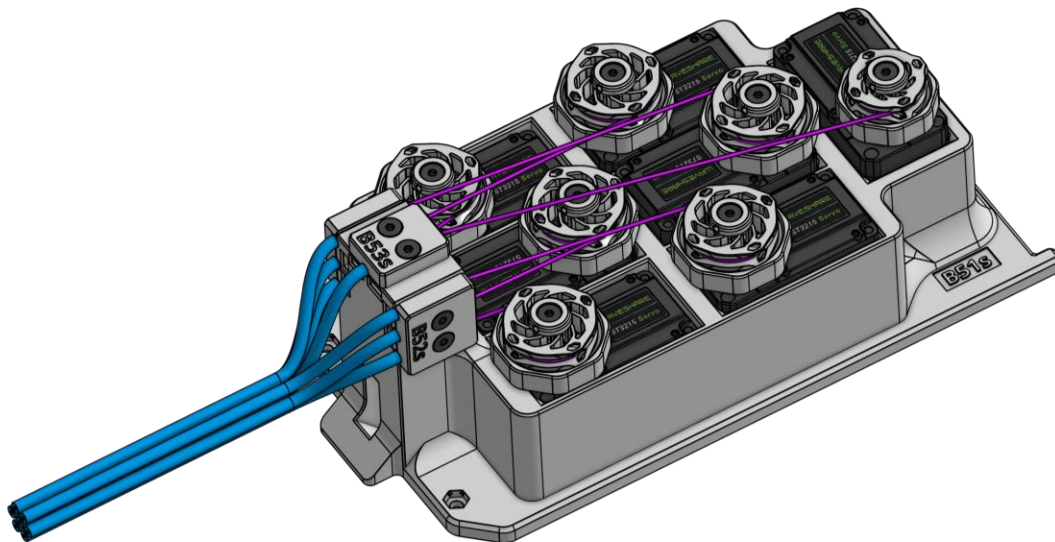
(Tipp: Wrap 2 x pieces of tape around each end of the tube before fixing them to have better grip.)



Step 10e

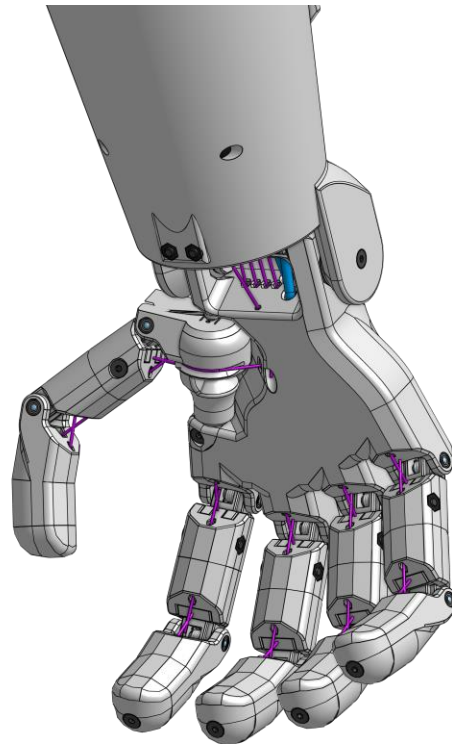
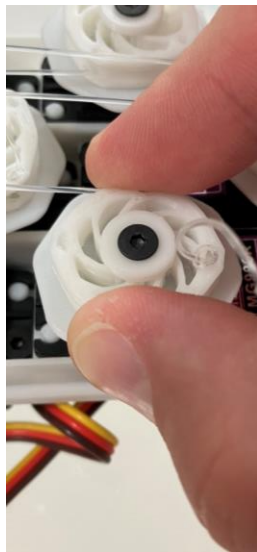


Insert **fluorocarbon wires** coming out of the **teflon tubes** in shown holes of the **B26** and **B31** connectors and reinsert them in the 2 holes in **B27** (you will have to unscrew and rescrew the M3 16mm screw). Wires and tubes will be hidden in following slides.



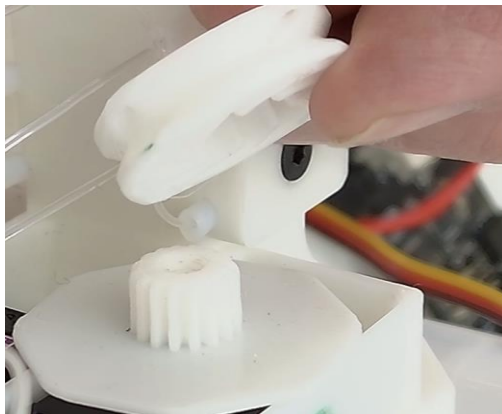
Note

After inserting the wire into **B27**, tie a knot like shown in the picture, and rotate the spindle until the wires are tight while fingers are at around 45 degrees



Note

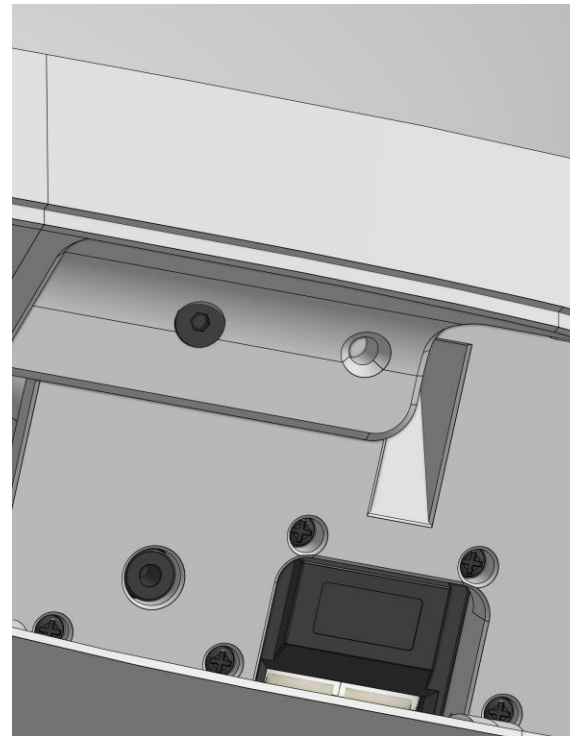
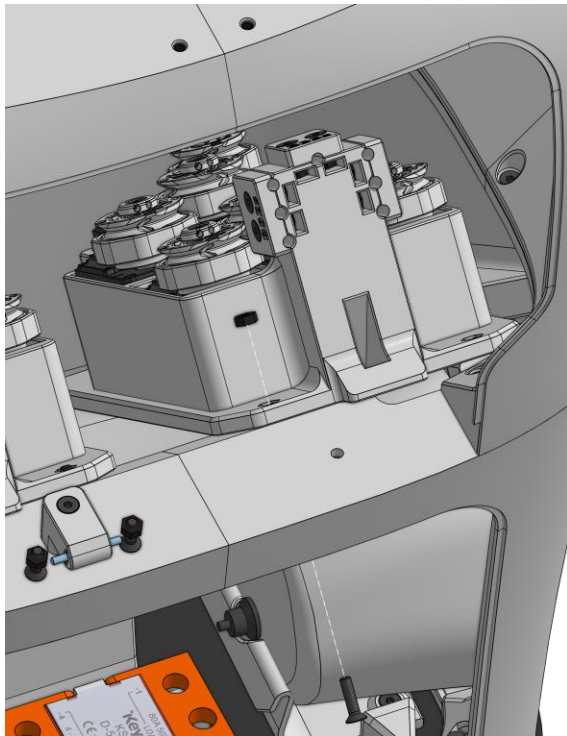
If you overtighten the spindle and need to reset, unscrew it, rotate it and screw it again



Step 11

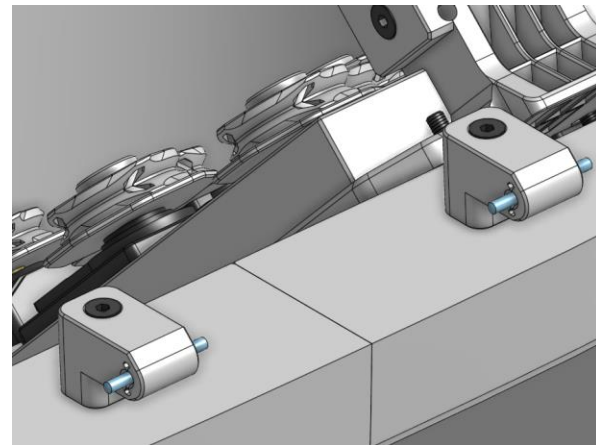
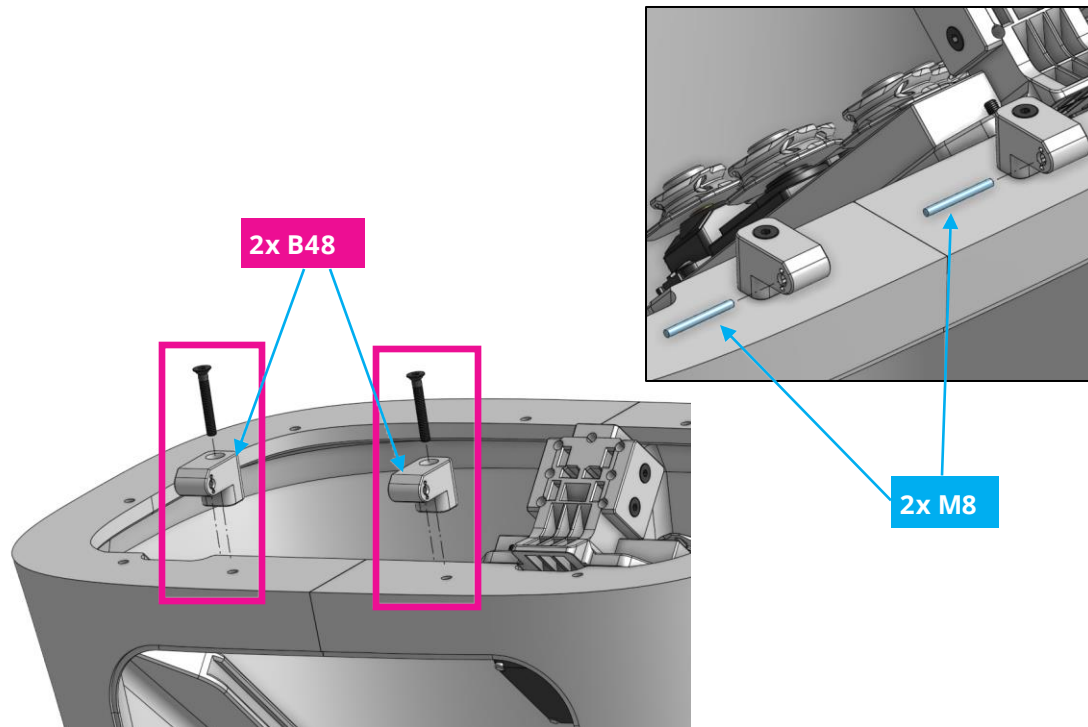


Slide servo array into ribcage and fix it using **1 x M3 nut** and **1 x M3 25mm screw**.



Step 12a

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



Step 12b



2



8x

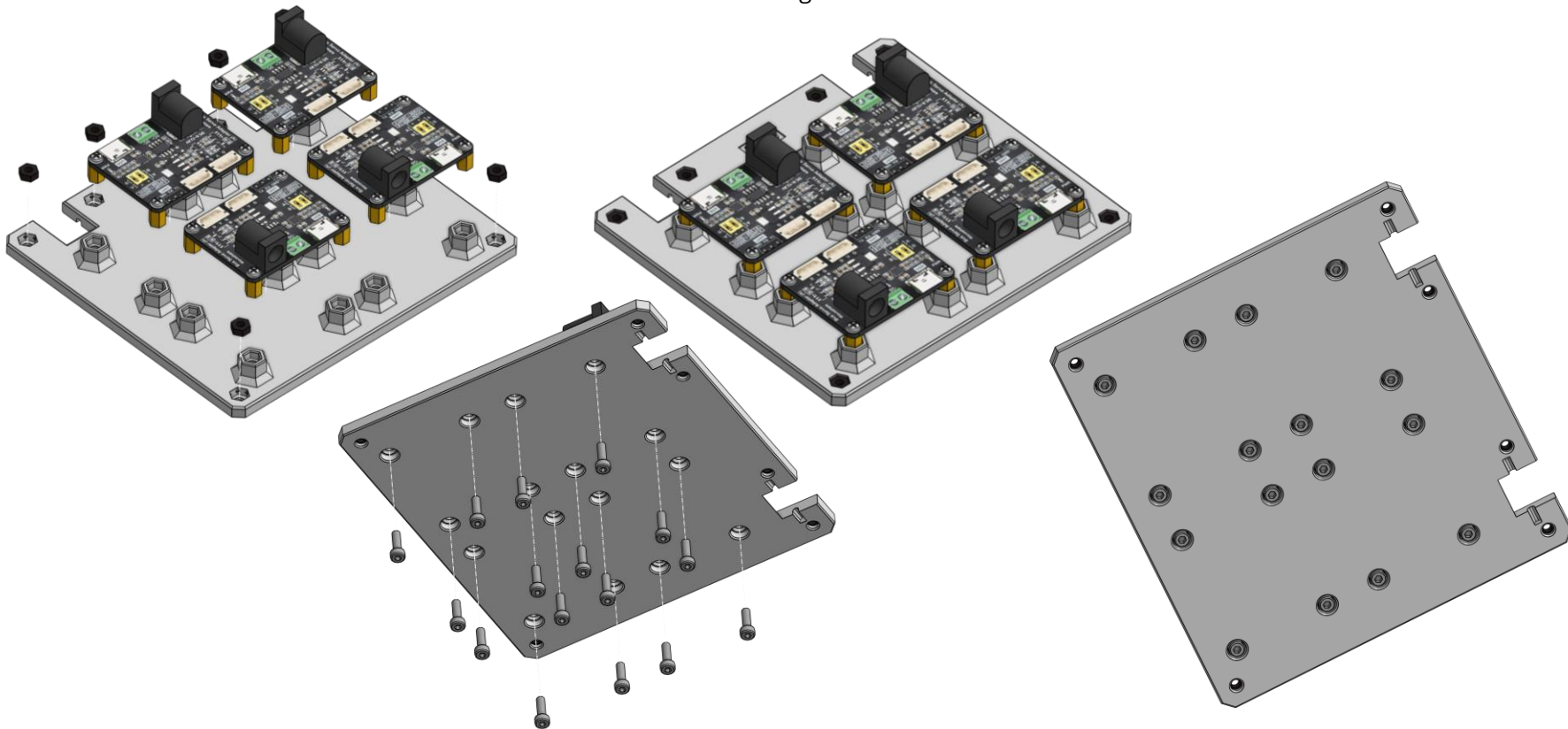


6x



8x

Insert **6 x M3 nuts** and **8 E17 assemblies** in **B45**. Fix the distancers using **16 x M2.5 8mm screws**.

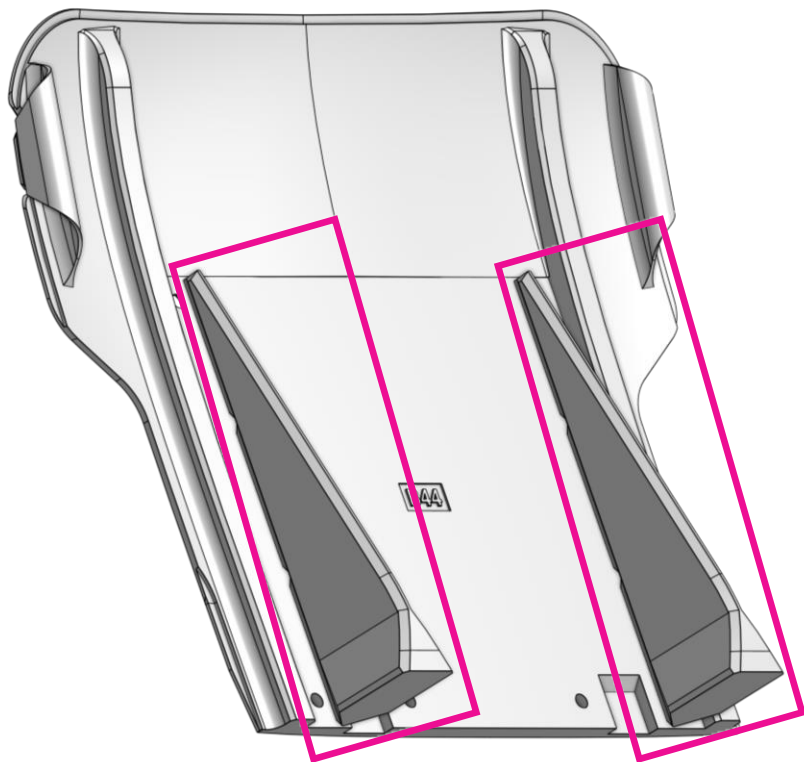


Step 12c

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

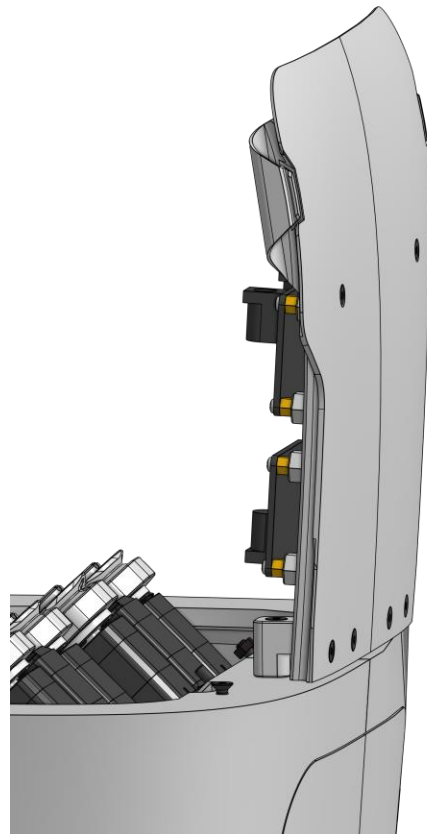
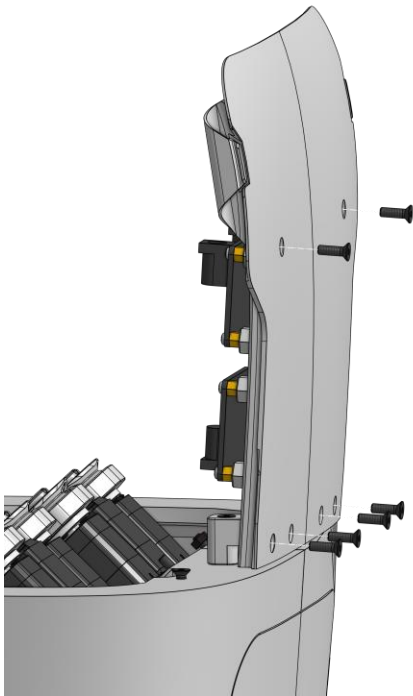


2



Step 12d

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



2



10x

Step 13a

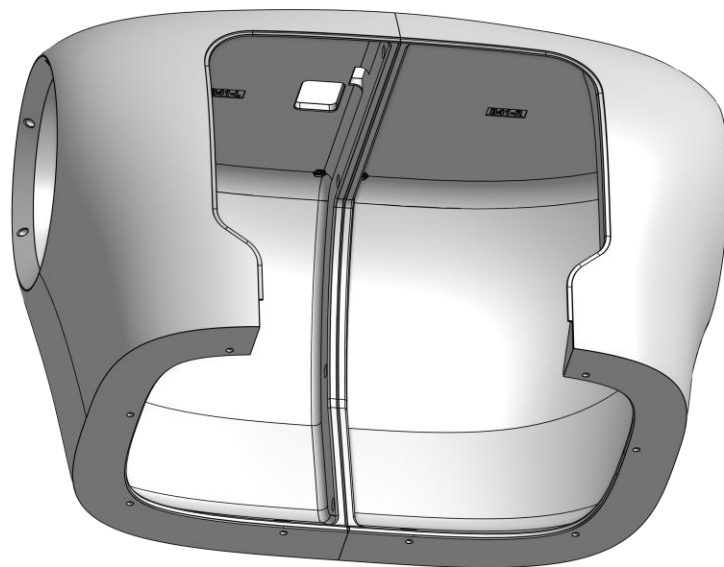
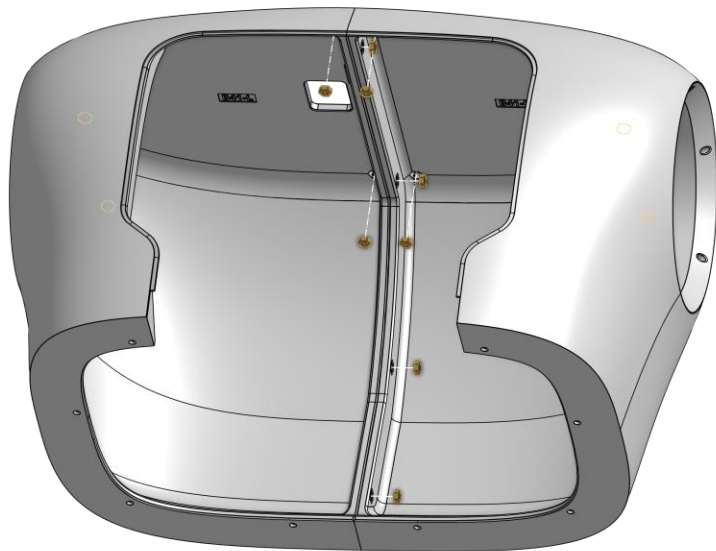
Insert **12 x M3 nuts** into **B41-L** and **B41-R**.



2



12x



Step 13b

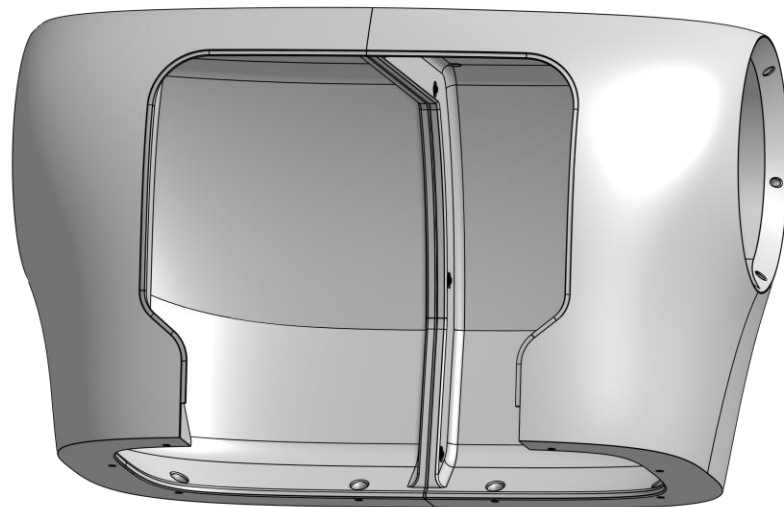
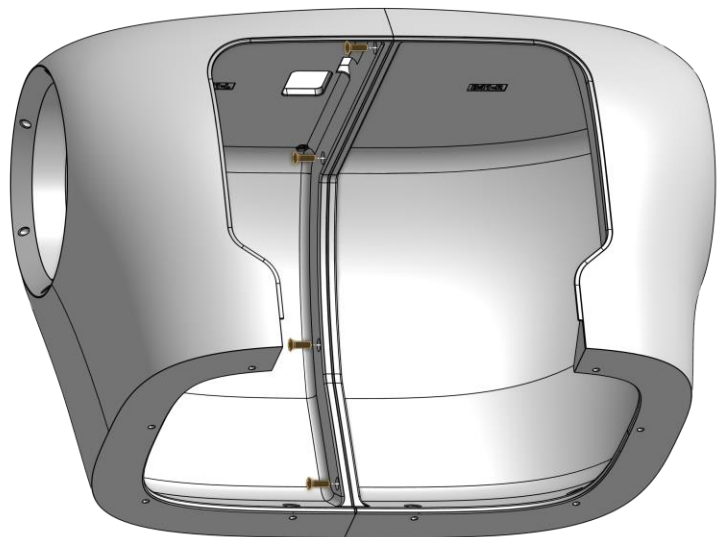
Connect **B41-L** to **B41-R** using 4 x **M3 10mm** screws.



2



4x



Step 13c

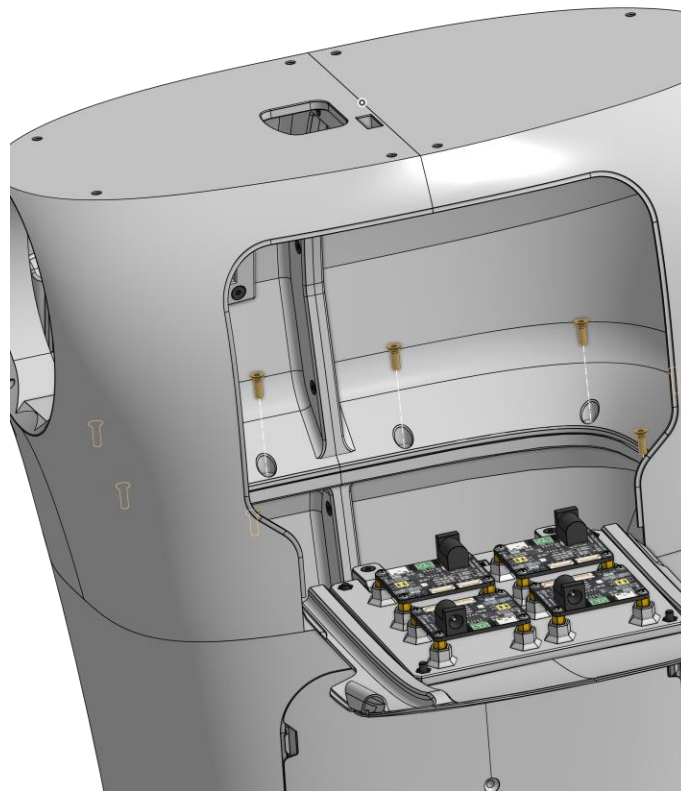
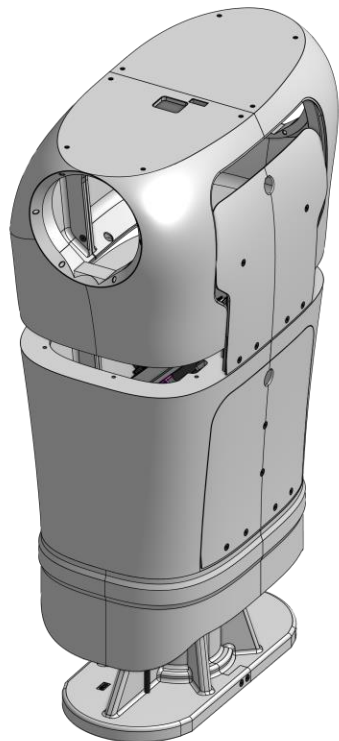
Connect **Clavicles** to **assembly** using 8 x **M3 10mm** screws.



2

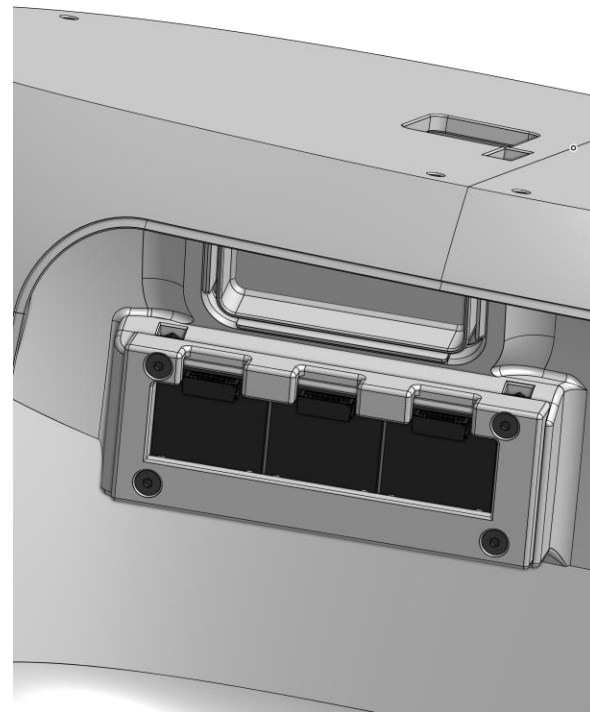
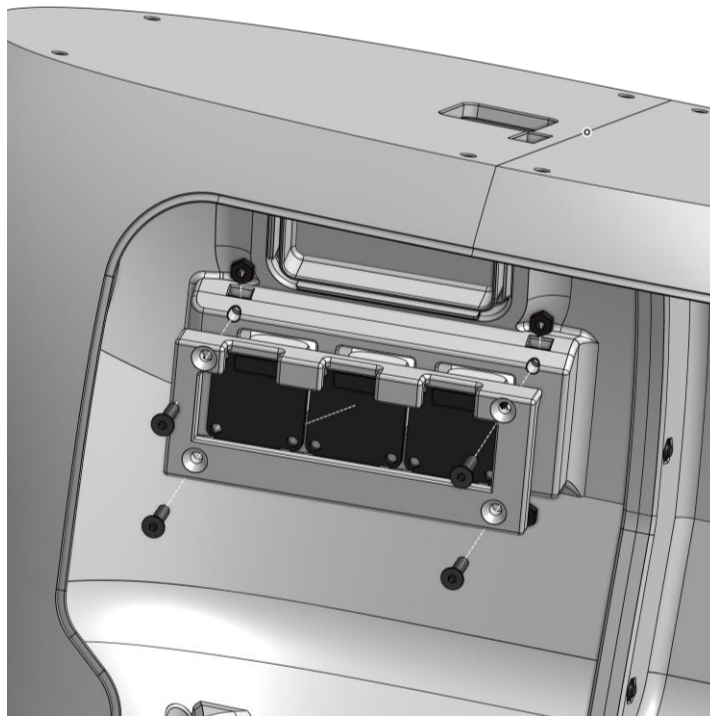


8x



Step 14

Assemble **3 x E25** to upperbody using **B58**, **4 x M3 nuts** and **4 x M3 12mm screws**



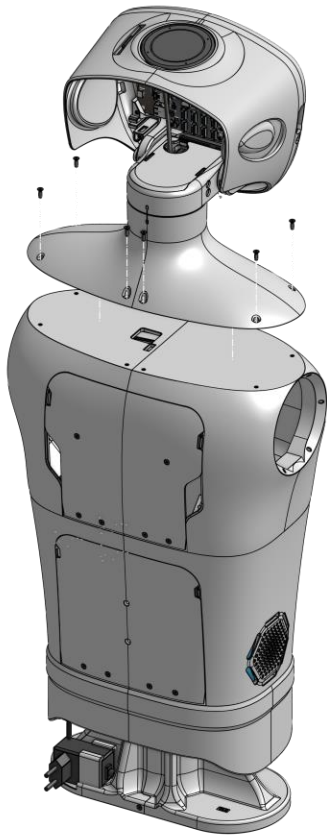
Step 14d

Push **B55-logo** in **B41-L**



Step 15

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



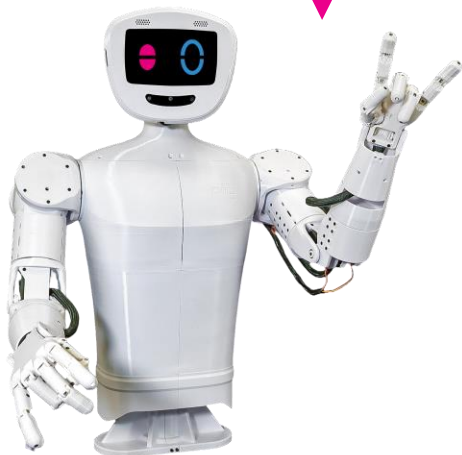
2



8x

Congratulations

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



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.



team@pib.rocks

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