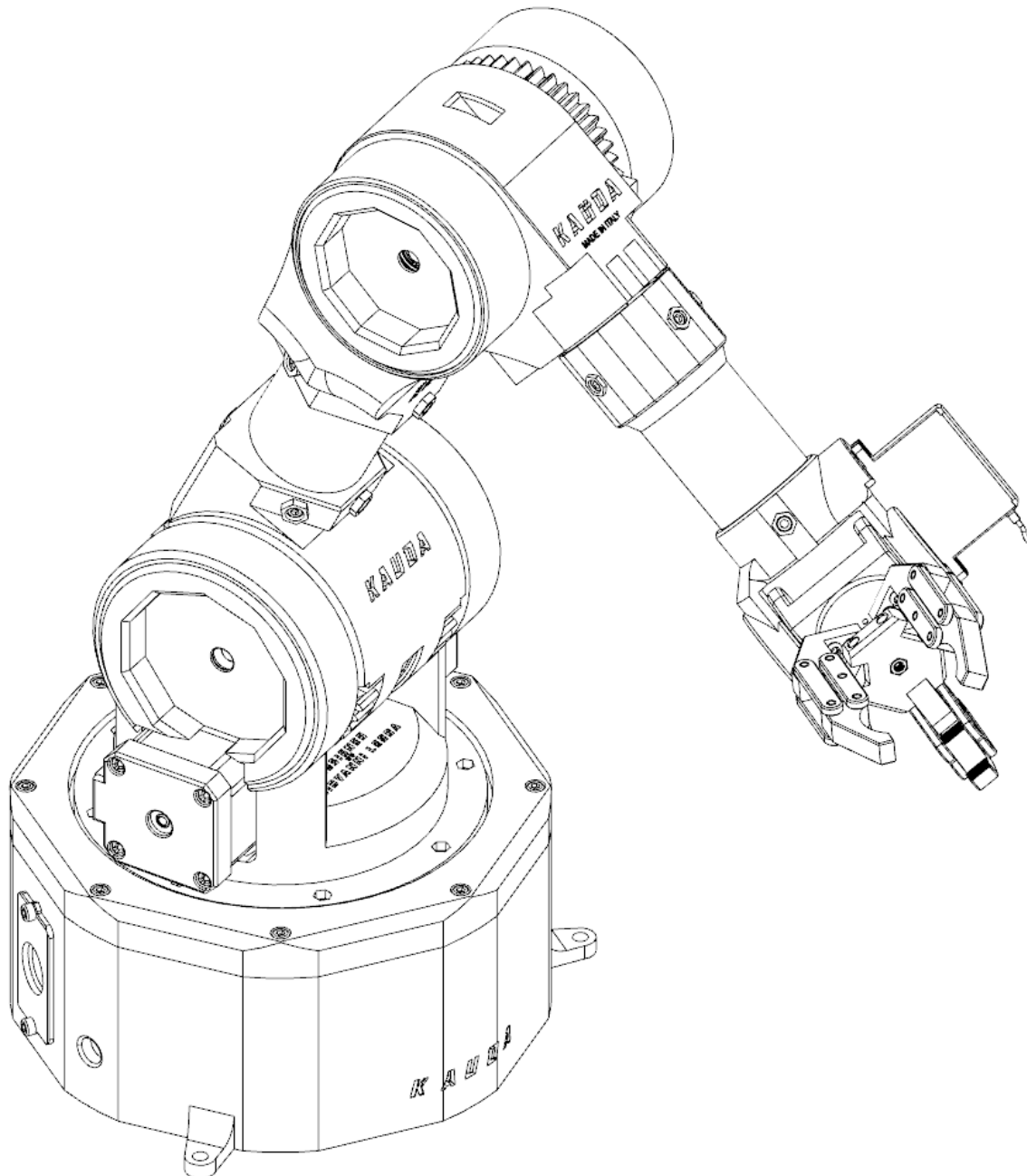


DIY-TECH

KAUDA

ROBOTIC ARM

Giovanni Lerda



010



SUMMARY

PREMISE.....	4
GENERAL WORKING RULES.....	4
MATERIAL LIST	5
3D PRINTED PARTS:	5
HARDWARE PARTS:	5
3D PRINTED PARTS [OPTIONAL]:.....	5
ELECTRONICS:	5
ASSEMBLING.....	6
BASE	6
AXIS 1.....	9
AXIS 2.....	12
AXIS 3.....	13
AXIS 4	15
AXIS 5.....	16
GRIPPER	18
CABLES MANAGEMENT.....	20
CONNECTORS.....	22

PREMISE

This Manual covers the main mechanical checks, the essential checks and the assembly of components supplied in bulk, to carry out the delivery of the new factory product (the sequence of operations is not binding).

It is very important to strictly follow what has been described. Interventions superficially carried out or even omitted can generate personal damages to the buyer, to the product, etc ... or produce, in the simplest of hypotheses, unpleasant disputes.

Note:

For any request, further information, etc ... contact the product manufacturer.

GENERAL WORKING RULES

The following advice, recommendations and warnings guarantee rational interventions in the maximum operational safety, significantly reducing the probability of accidents, damage of any nature and downtime. Yes therefore, he advises to observe them scrupulously.

TIPS:

- Always use top quality equipment.
- Keep the tools close from hand during the operations, preferably according to a predetermined sequence and in any case never on the vehicle or in hidden or inaccessible positions.
- Keep the workplace tidy and clean.
- To tighten screws and nuts, start with those of larger diameter or internal ones, proceeding at "cross" with subsequent "pulls".

MATERIALS

MATERIAL LIST

3D printed Parts:

QTTY	NAME	REF P.
1	BS-KRA	6
2	DR-2-KRA	22
1	RG-KRA	7
1	BS-RG-KRA	8
1	AX1	9
1	AX2	12
2	AX2-RD-KRA	12
1	RD-TNY-KRA	6
3	RD-STNY-KRA	9
1	AX3	13
1	AX4-RD-KRA	15
1	AX4	15
1	RT1-KRA	15
1	RT2-KRA	16
1	AX5	17
3	PZ1-KRA	18
6	PZ2-KRA	19
6	PZ3-KRA	19
3	PZ4-KRA	19
1	PZ5-KRA	20
3	PZ6-KRA	20

Hardware Parts:

QTTY	NAME	REF P.
2	Steel rod Ø8 x 80	12
40	Steel balls Ø8	7
1	Round tube Ø35 x 90	12
1	Round tube Ø40 x 110	15
1	Steel rod Ø8 x 15	16
/	M3 nut	/
/	M3 x 12 SHCS screw	/
/	M3 x 20 SHCS screw	/
/	M3 x 12 SHCS screw	/
18	Steel Rod Ø3 mm	19
8	M3x5,7 Insert	8

needs to include 4x 608zz bearings

heatset inserts did not look compatible

soldering iron, crimp connectors and tool, clamps

3D printed Parts (optional):

QTTY	NAME	REF P.
1	AX1-L-DEC-KRA	11
1	AX1-R-DEC-KRA	11
2	AX1-DEC-KRA	11
1	AX3-IDC-L-KRA	14
1	AX3-IDC-R-KRA	14
1	AX3-DEC-L-KRA	14
1	AX3-DEC-R-KRA	14
1	AX4-DEC-KRA	17

Electronics:

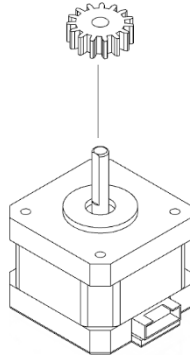
QTTY	NAME	REF P.
4	Nema 17 Stepper-M 0.42/0.59 Nm	6
2	G16 - 8 Pin	22
1	G20 - 12 Pin	22
1	DC 6V Extended Gear Motor with Shaft	18
4	Nema 17 Cables	/
2	MG996R Servo-M	15

ASSEMBLING

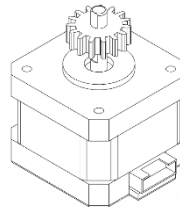
BASE

gears need hubs to be more secure. also this gear had significant backlash

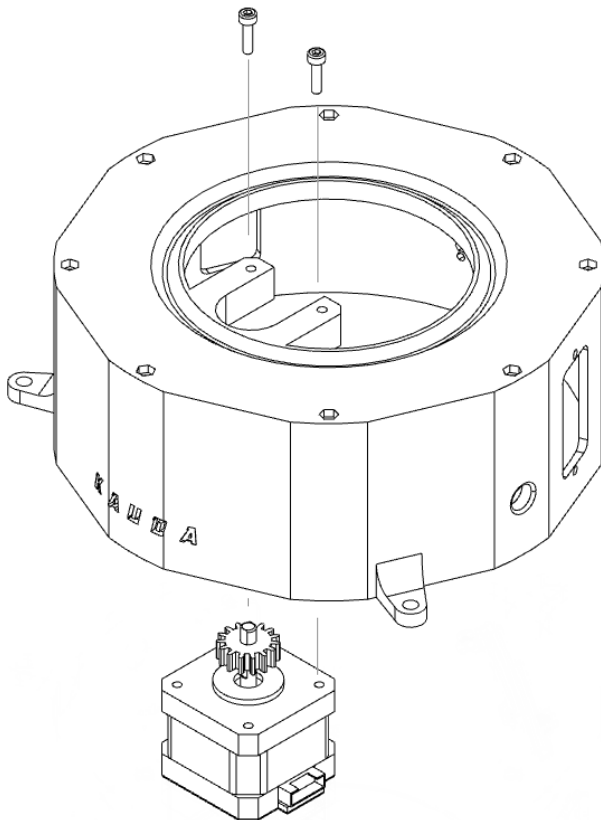
- 1 Insert the gear wheel ("RD-TNY-KRA") on the shaft of the Nema-17 stepper motor.



i have re-designed this part to have less backlash and to have a hub

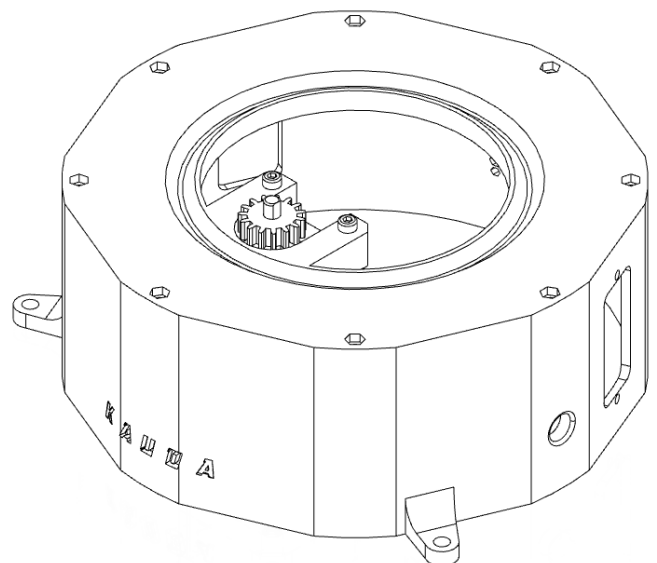


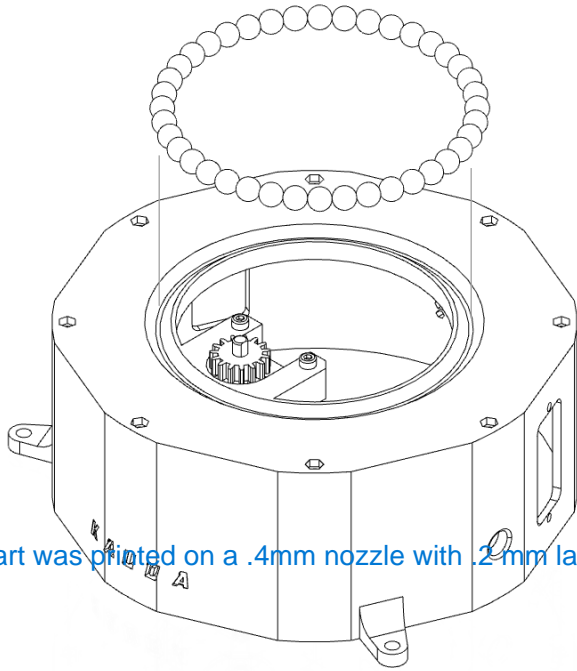
this stepper motor mount is prone to creep



- 2 Insert the stepper motor in the space provided inside the Base ("BS-KRA"), anchoring it with 2 M3x20 screws

m3x20 is too long



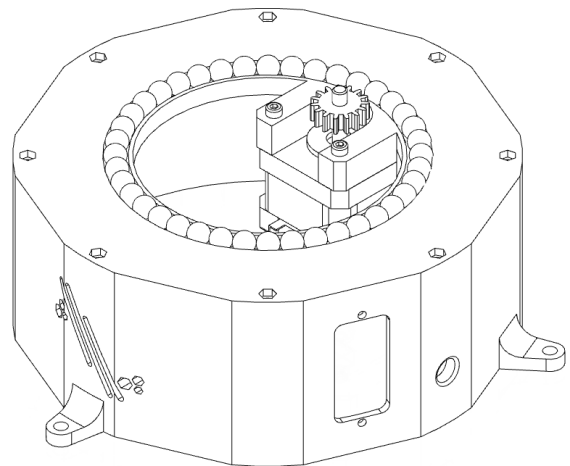


this part was printed on a .4mm nozzle with .2 mm layer height

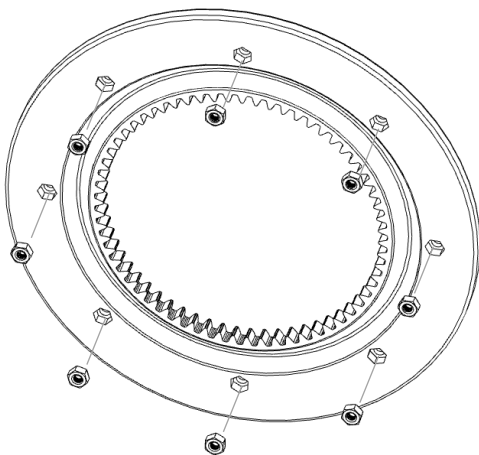
cavity does not fit all 40 balls, maybe size up the file?

- 3 Insert the 8 mm diameter balls (**Steel Balls**) inside the appropriate cavity, for a total of 40 balls.

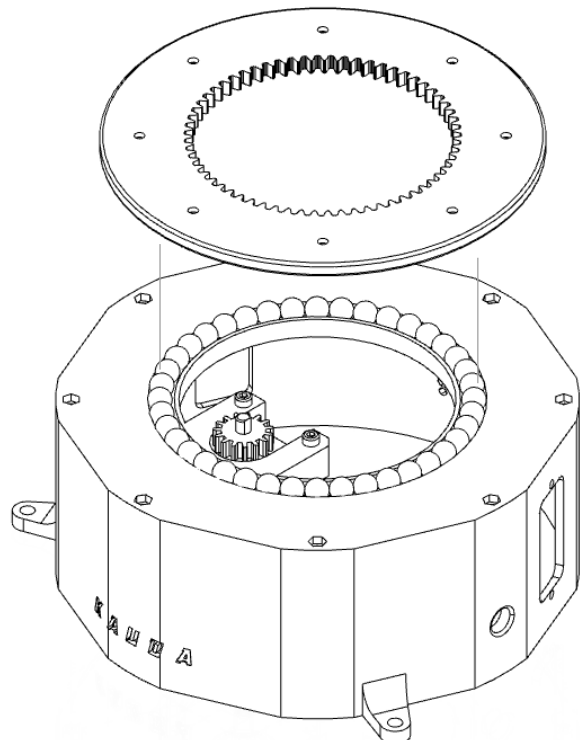
It's recommended to lubricate the balls to decrease friction.



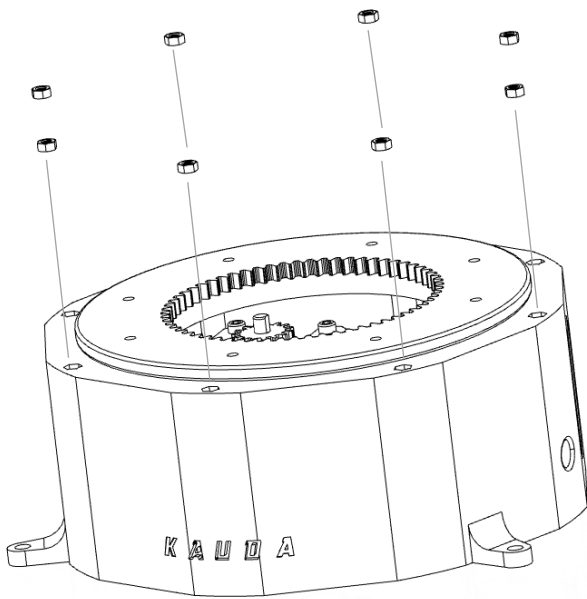
- 4 Insert the 8 M3 nuts inside the inner ring (**"RG-KRA"**).



- 5 Rest the inner ring with the 8 M3 nuts inserted inside it on the balls, so that the cavity matches the position of the balls.



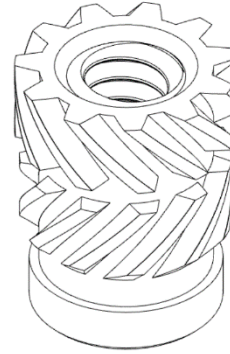
nuts are actually on underside



6

Insert the 8 M3 insert inside the Base ("BS-KRA").

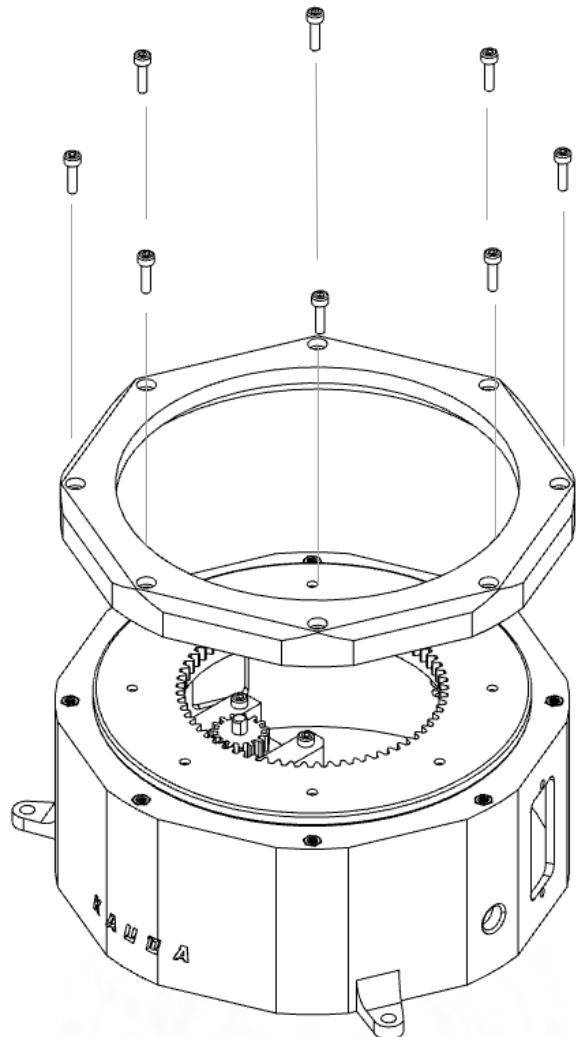
did not use heatset inserts, just heat pressed nuts

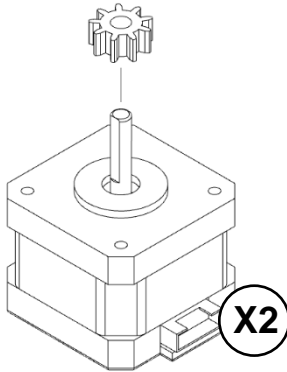


M3 insert

7

Anchor the outer ring ("BS-RG-KRA") to the base with 8 M3 x 20 screws, making sure that once fixed, the inner ring ("RG-KRA") rotates according to the correct movement.





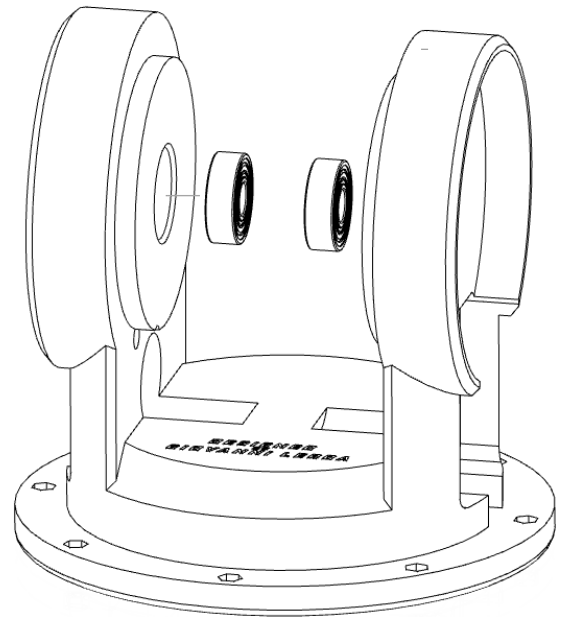
- 1 Insert the gear wheel ("RD-STNY-KRA") on the shaft of the Nema-17 stepper motor.

Perform the operation on two stepper motor.

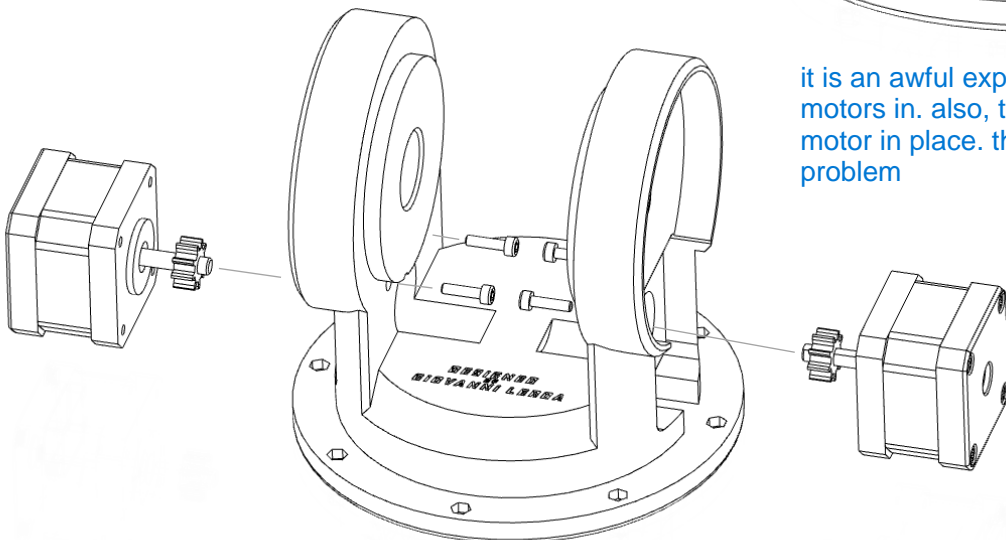
this part had to be sized down since it would not lock onto the shaft. i suggest re-printing with a smaller nozzle, and modifying the part to accept a nut and set screw

- 2 Insert the two bearings ("Bearing") in the appropriate cavities of axis 1 ("AX1").

should have a mechanical end-stop for the bearing seat



it is an awful experience trying to lock the stepper motors in. also, there should be 4 bolts to lock the motor in place. this may also help the shaft tilting problem

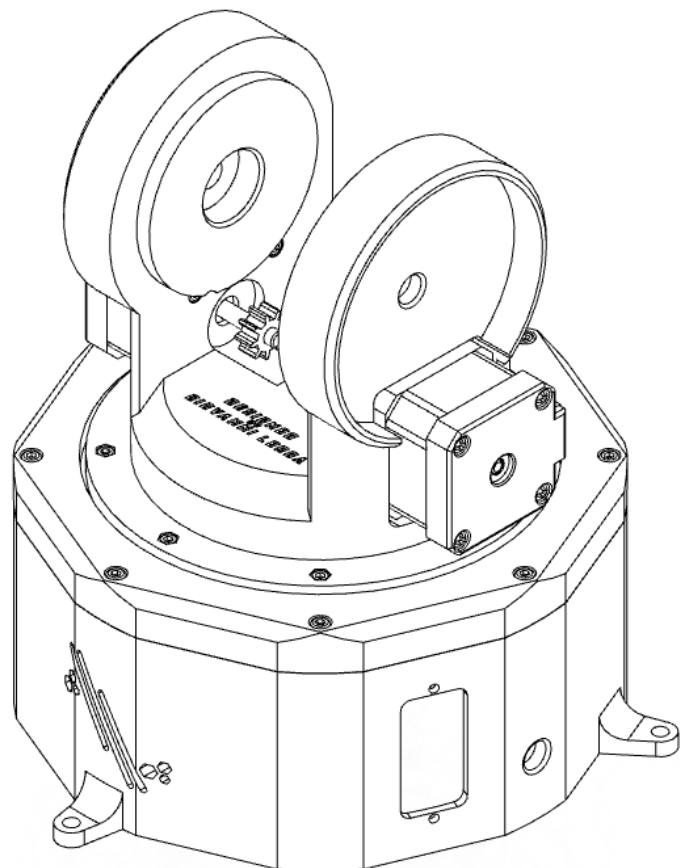
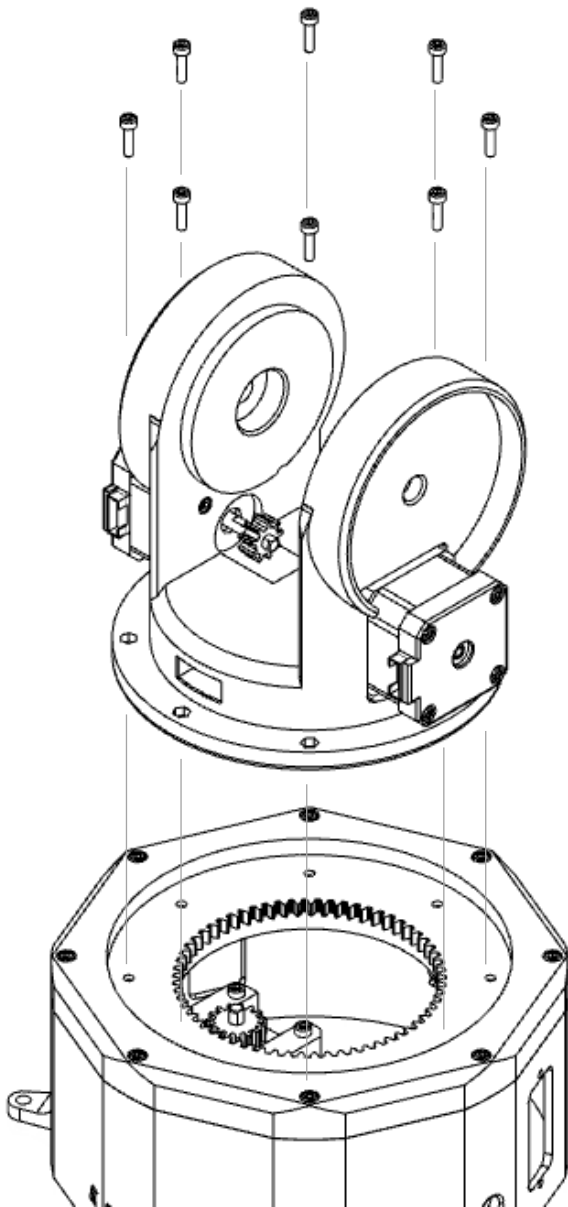


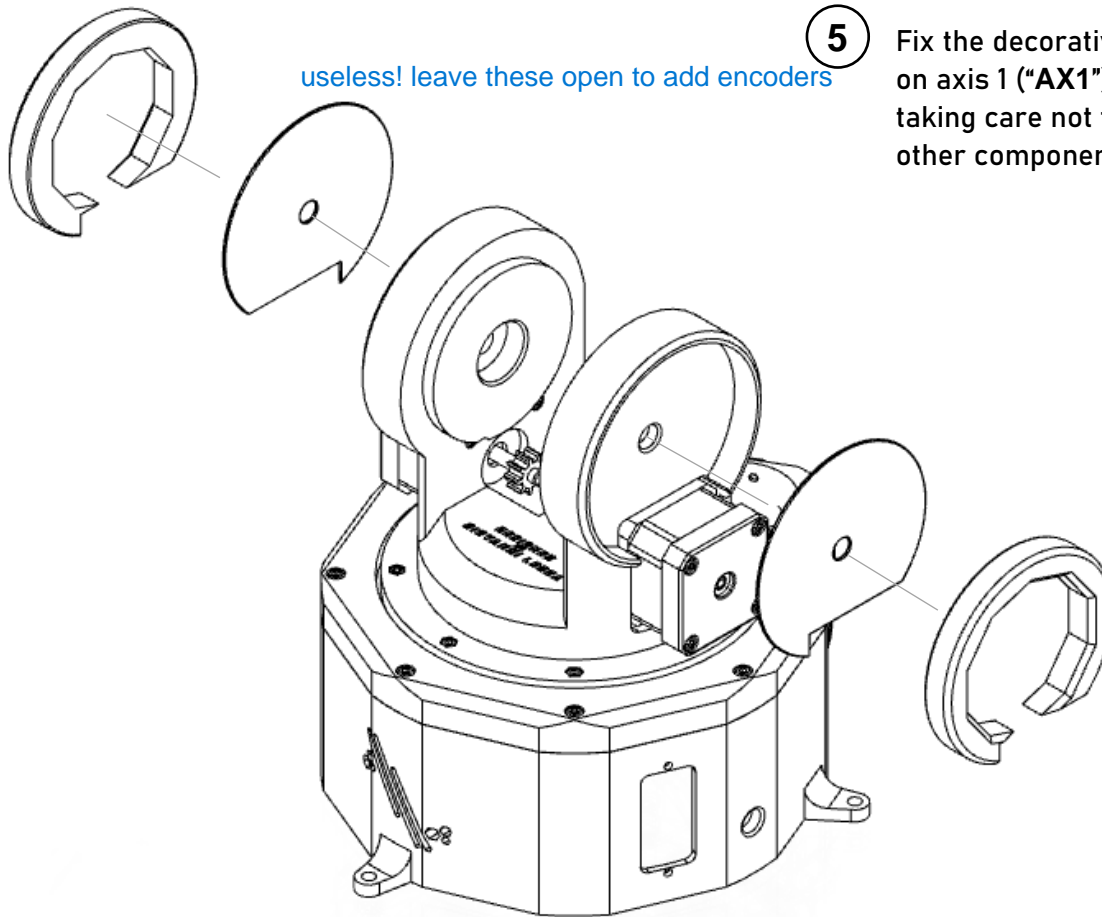
- 3 Insert the 2 stepper motor in the space provided inside the Axis 1 ("AX1"), anchoring it with 4 M3x12 screws

too long. m3x20 bolts will stick into the balls causing the bearing to bind

- 4 Fix the 8 M3 x 20 screws to join axis 1 ("AX1") with the inner ring ("RG-KRA"), matching the holes as shown in the figure.

So as to allow the fixing of the screws with the nuts previously installed in the inner ring.





5

Fix the decorative components on axis 1 ("AX1") as shown, taking care not to damage any other component.

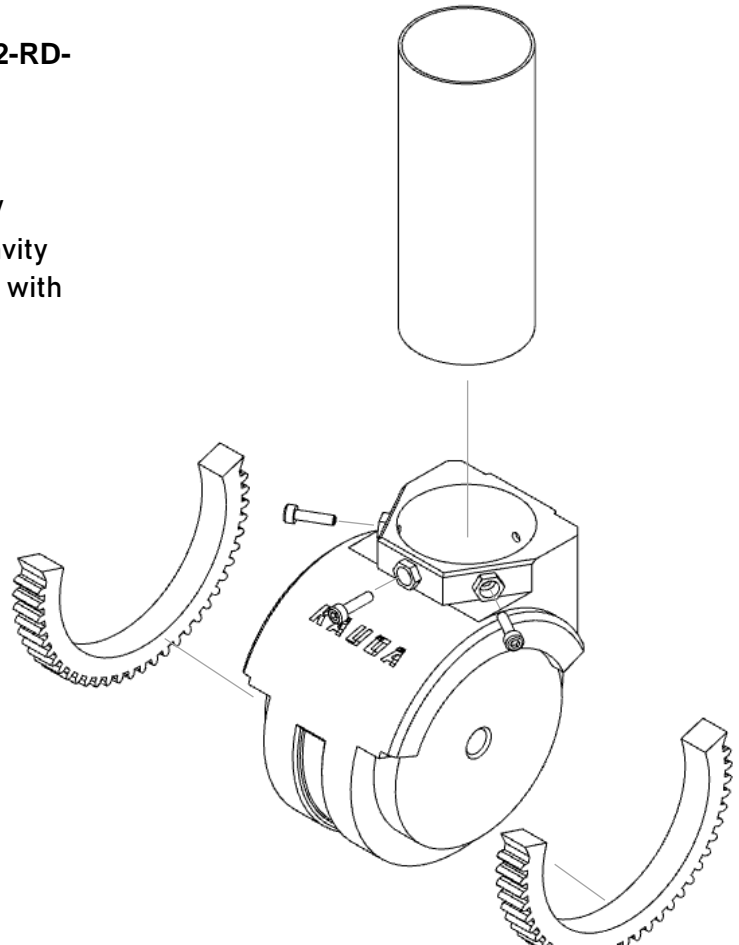
i used a pvc tube to cut costs. works perfect

- 1 Fix the two half-toothed wheels ("AX2-RD-KRA") with plastic glue.

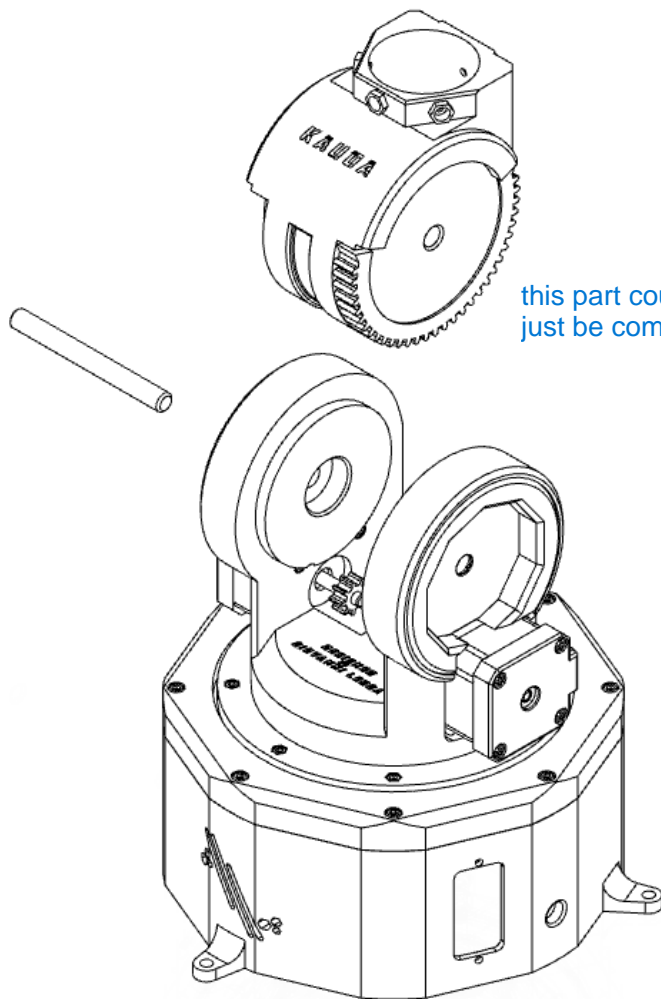
Insert the $\varnothing 40 \times 110$ mm tube ("Round aluminum tube $\varnothing 40 \times 110$ ") into the cavity of axis 2 ("AX2"), fixing it if necessary with screws M3 x 12

Note:

To fix the tube to axis 1 with M3 screws, it is necessary to make holes on the tube which are useful for fixing.



this part could needs to be split in half for printability, also the gears can just be combined in the model



- 2 Join axis 2 ("AX2") and axis 1 ("AX1") with the relative components already installed by using an $\varnothing 8$ mm tube ("Steel rod $\varnothing 8 \times 80$ ") which allows movement of axis 2 on axis 1.

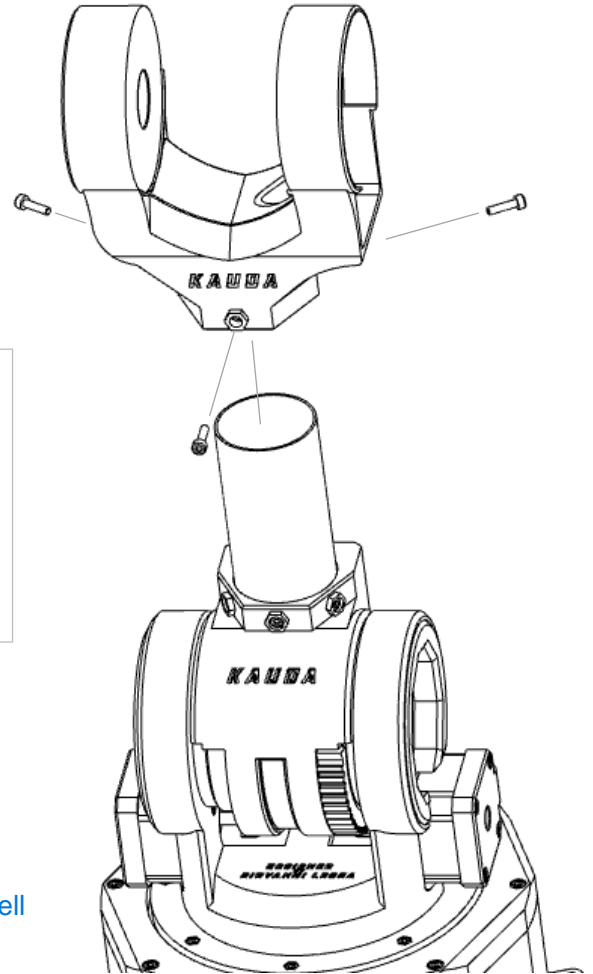
anything above 80mm is fine

- 1 Fix axis 3 ("AX3") in the correct position on the 40mm tube, inserting if necessary M3 screws in the appropriate cavities.

yea very necessary!

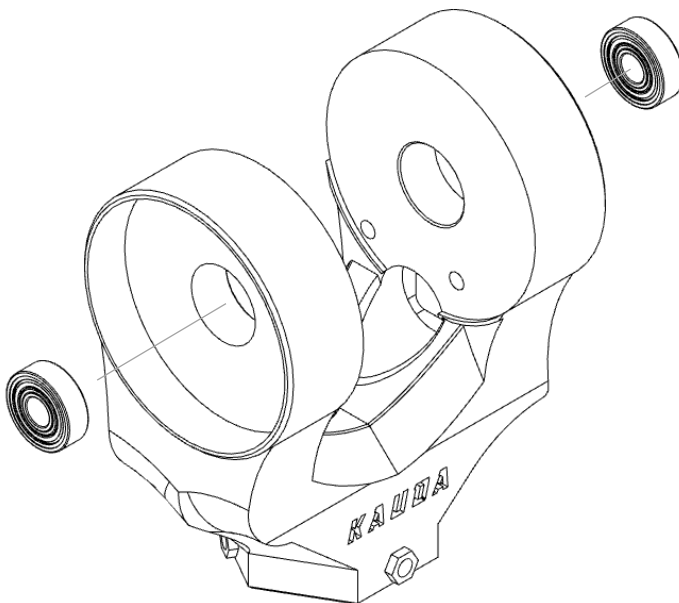
Note:

To fix the tube to axis 1 with M3 screws, it is necessary to make holes on the tube which are useful for fixing.



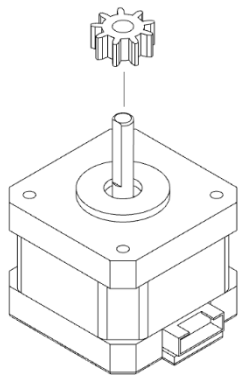
these bearings should have an end stop

also, these hole should be sized up, they can't pass an m3 very well



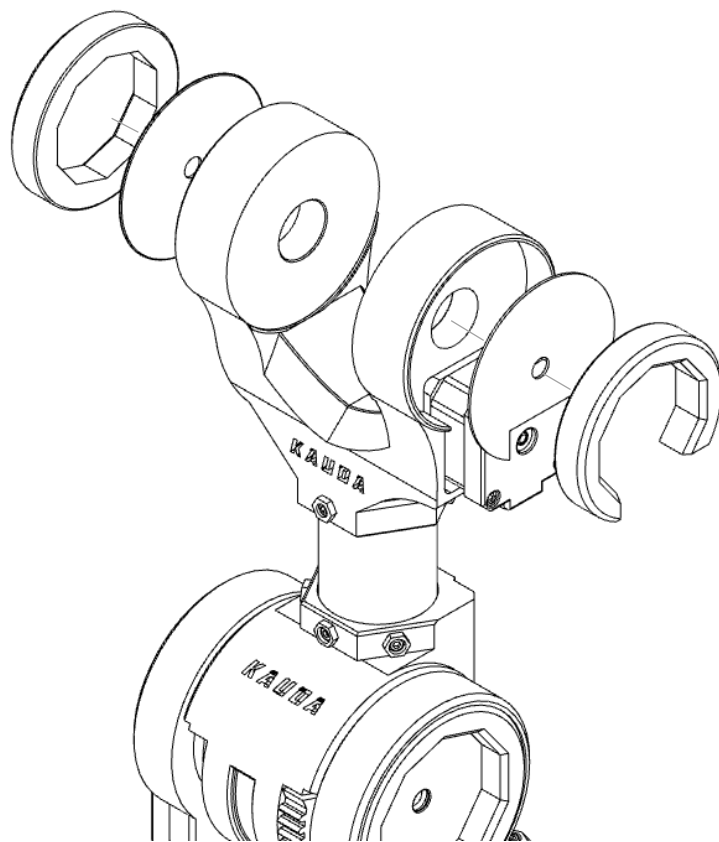
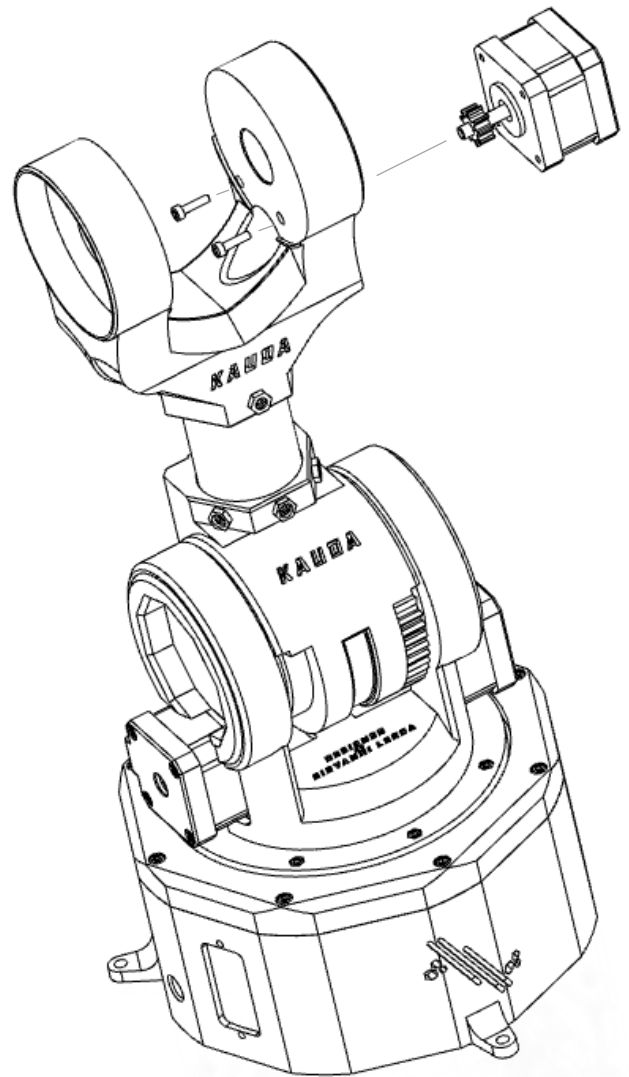
- 2 Insert the bearings ("Bearing") in the appropriate cavities as shown in the figure.

this part should be split and joined with pins/super glue

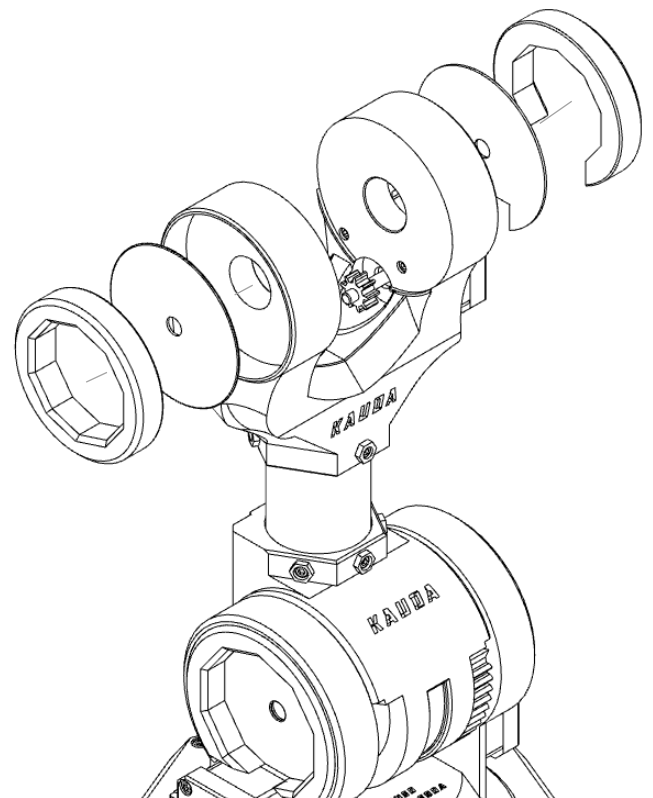


- 3** Insert the gear wheel ("RD-STNY-KRA") on the shaft of the Nema-17 stepper motor.

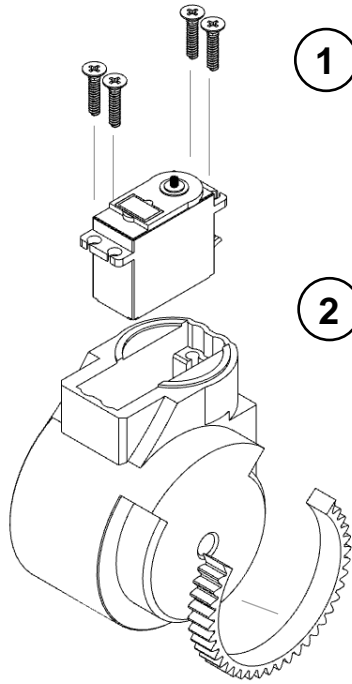
Insert the motor in the dedicated cavity on the right side of axis 3 ("AX3"), fixing it with 2 M3 x 12 screws.



- 4** Fix the decorative components on axis 3 ("AX3") as shown, taking care not to damage any other component.



this was waaay to tight, i had to press the motor in

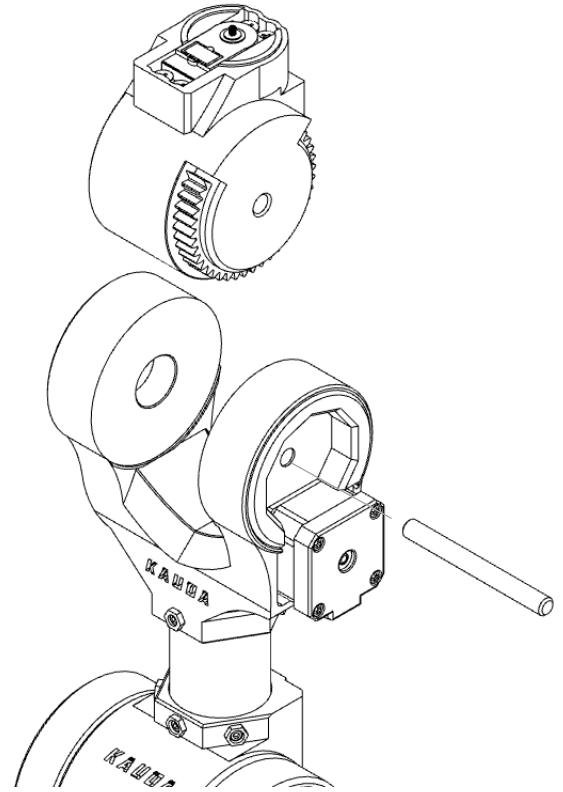


- 1 Insert the servo motor ("**MG996R Servo-M**") inside the cavity in axis 4, fixing it with 4 M3 x 12 screws

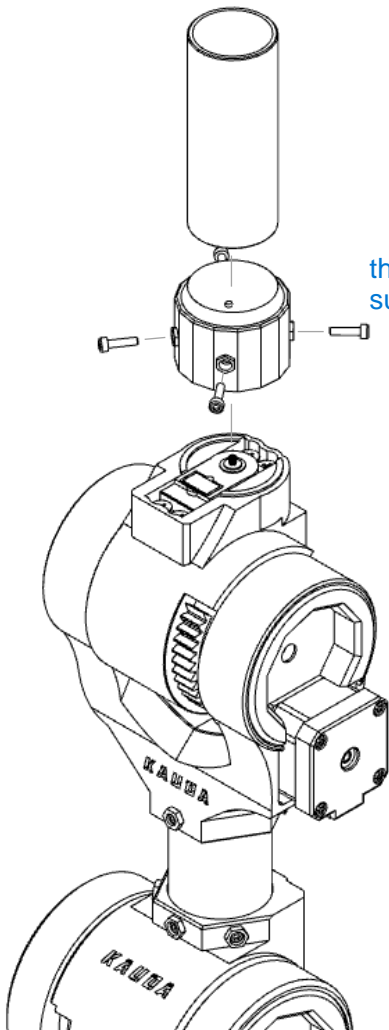
It is important to pass the motor cables through the cavity inside the component

- 2 Fix the half-toothed wheel ("**AX4-RD-KRA**") with plastic glue.

- 3 Join axis 4 ("**AX4**") and axis 3 ("**AX3**") with the relative components already installed by using an Ø8 mm tube ("**Steel rod Ø8 x 80**") which allows movement of axis 4 or axis 3.



this part was too tight, i sized up to 103%. also, i cut out the bottom face to get a flat surface for printability



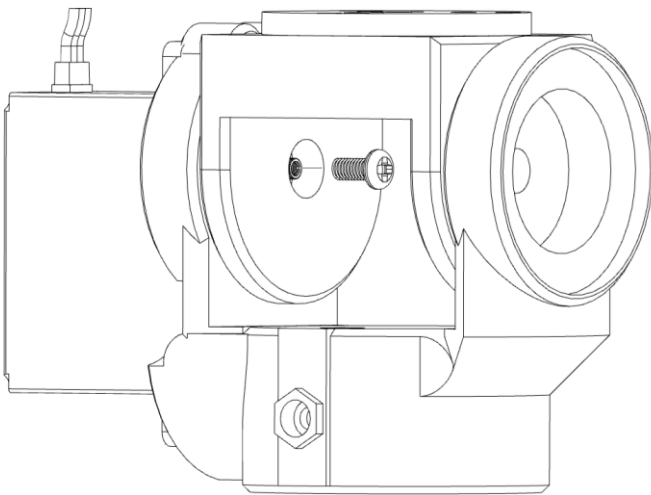
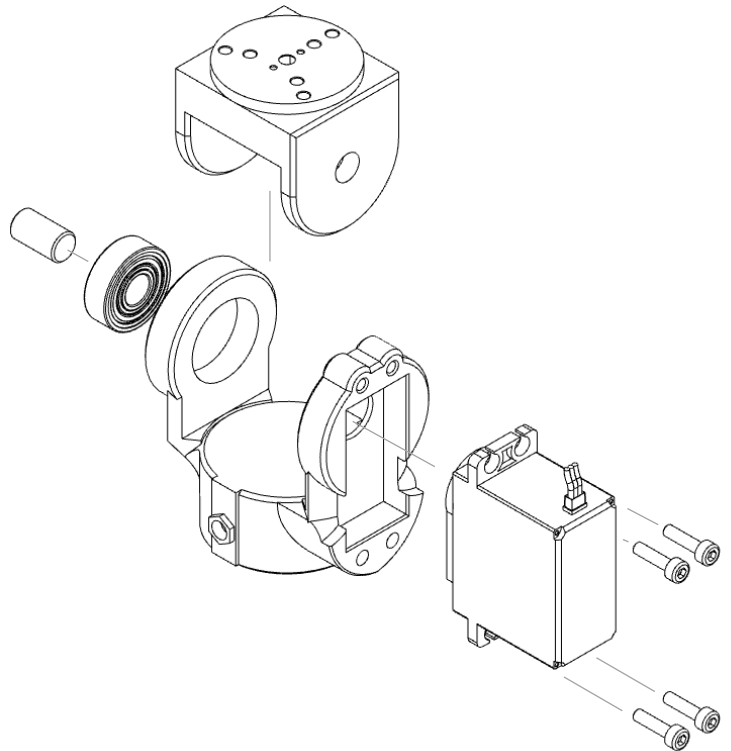
- 4 Fix the component ("**RT1-KRA**") on the servo motor using the appropriate screw supplied with the motor, screwing it on the motor shaft fixing the component.

Insert the Ø35 x 90 mm tube ("**Round aluminum tube Ø 35 x 90**") into the cavity of the component ("**RT1-KRA**") fixing it if necessary with screws M3 x 12

i used an acrylic tube

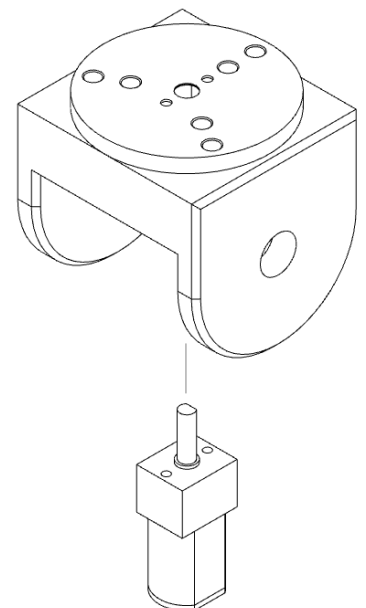
- 1 Install axis 5 on the component ("RT2-KRA").

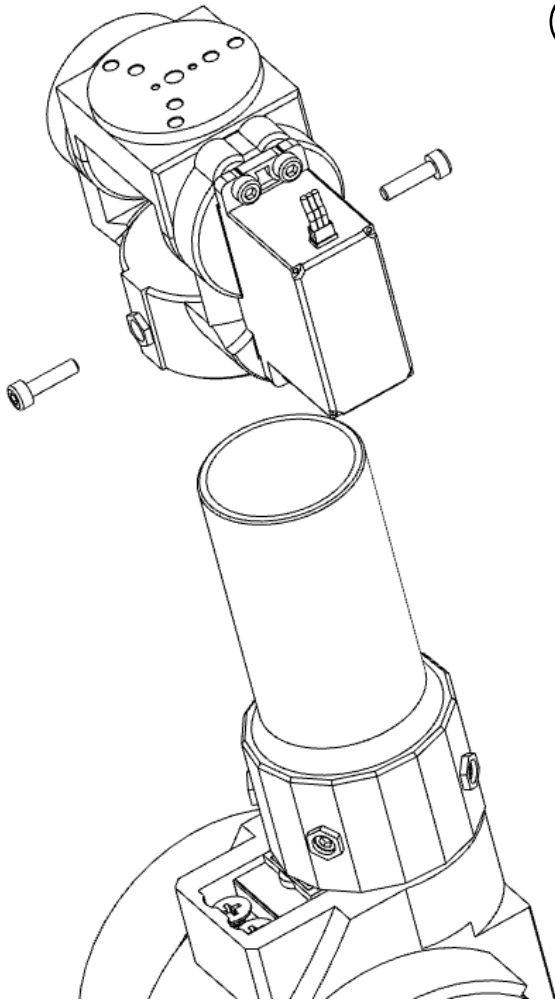
Insert the bearing ("Bearing") in the cavity plus the Ø8 x 15 mm ("Steel rod Ø8 x 15") rod and from the opposite side of it insert the servo motor ("MG996R Servo-M") in the right direction, fixing it with 4 screws M3 x 12.



- 2 Secure the servo motor with the screw supplied with it.

- 3 Fix the DC motor ("DC 6V Extended Gear Motor with Shaft") on axis 5.



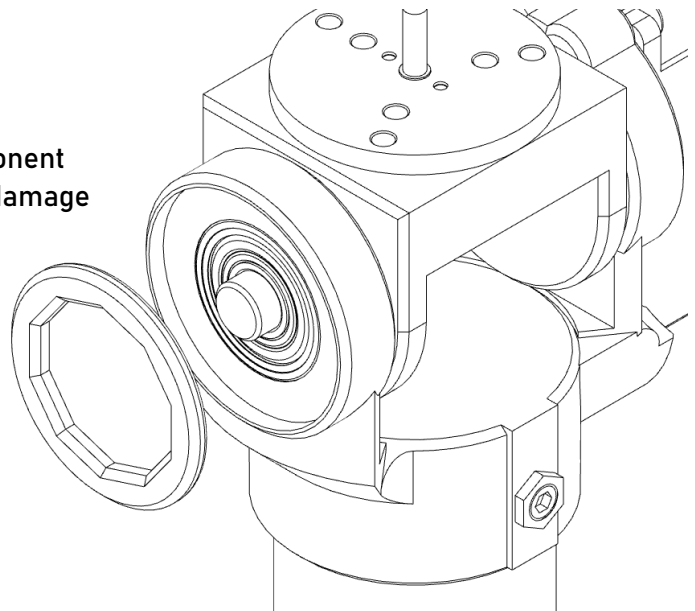


- 4 Fix axis 5 ("AX5") in the correct position on the 35mm tube, inserting if necessary M3 screws in the appropriate cavities.

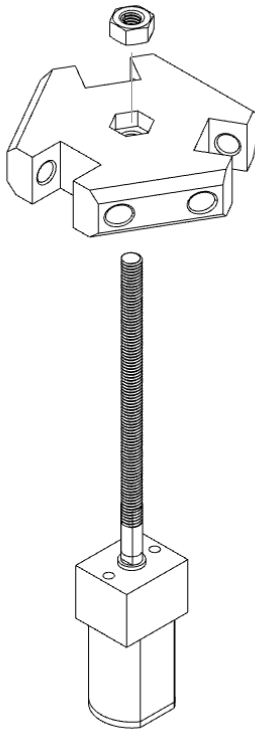
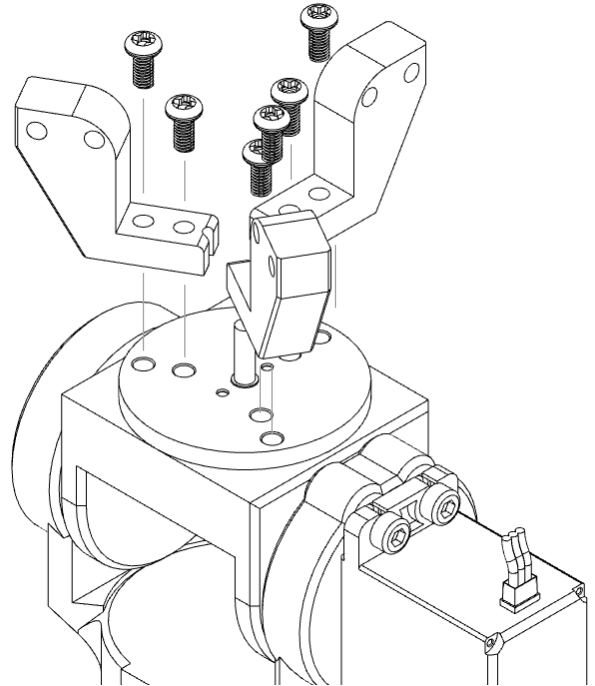
Note:

To fix the tube to axis 1 with M3 screws, it is necessary to make holes on the tube which are useful for fixing.

- 5 Fix the decorative component on the component ("RT2-KRA") as shown, taking care not to damage any other component.

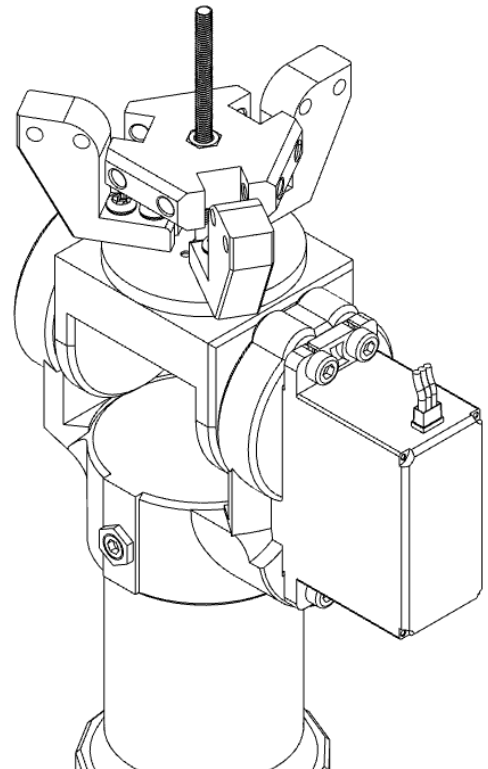


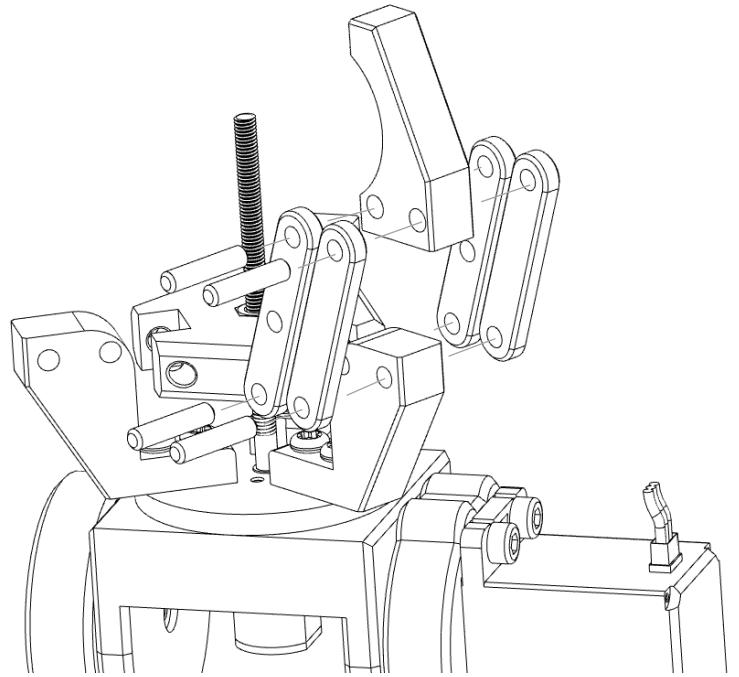
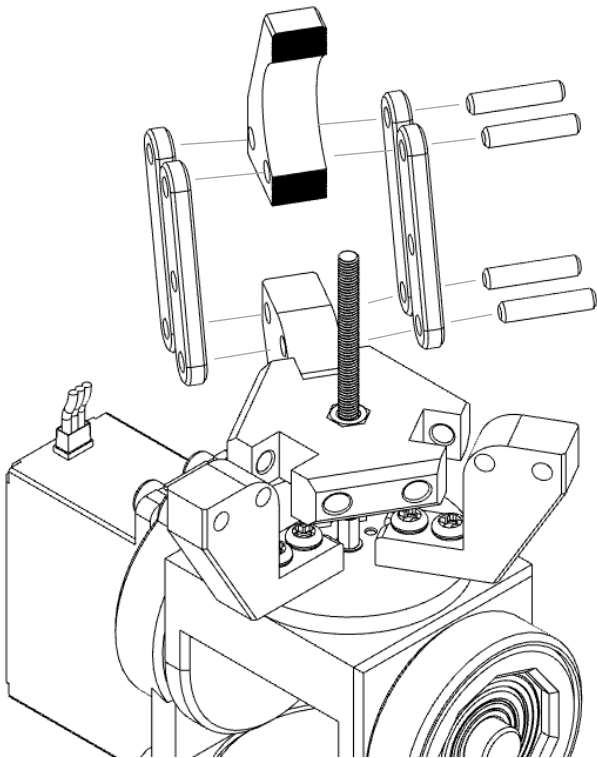
- 1 Fix the brackets ("PZ1-KRA") on axis 5 with the M3x 10 screws as in the picture.



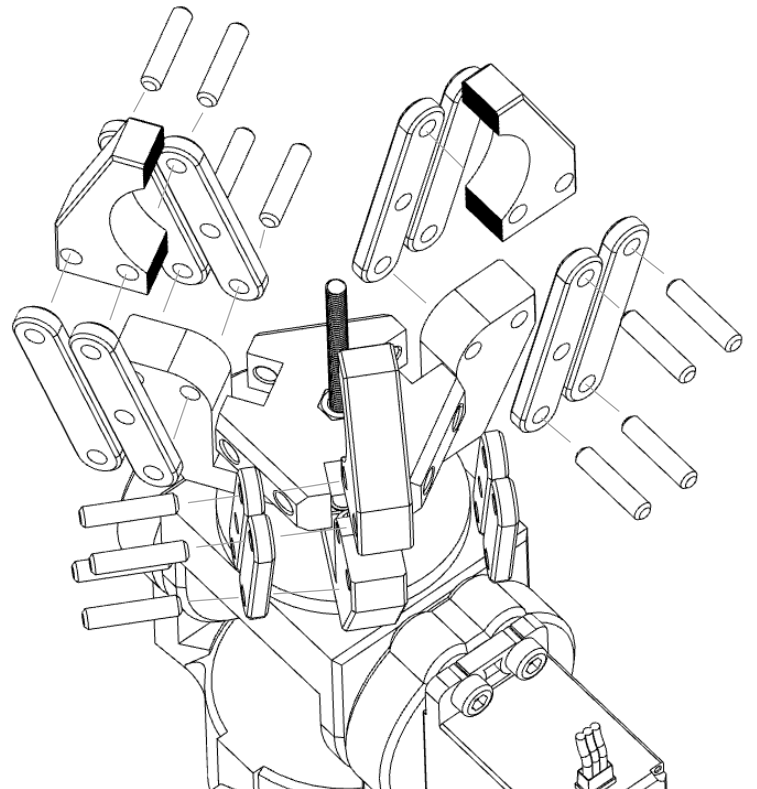
- 2 Insert an M3 nut inside the sliding bracket ("PZ4-KRA").

- 3 Insert the piece on the DC motor shaft ("DC 6V Extended Gear Motor with Shaft") as shown in the correct position and with the M3 nut facing upwards.



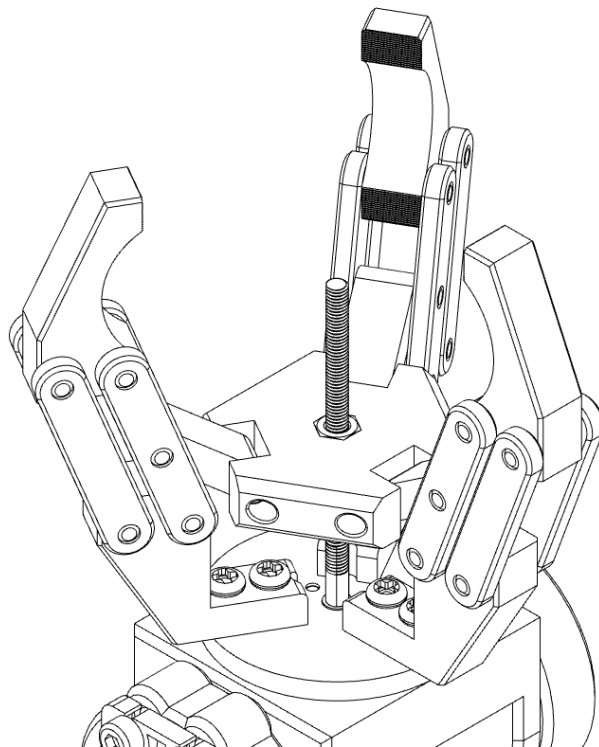
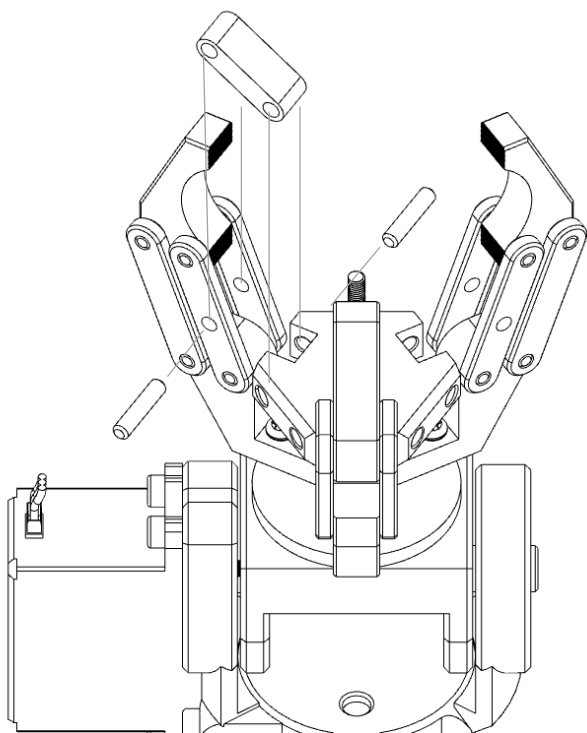


- 4** Assemble the remaining parts of the gripper (“PZ2-KRA – PZ3-KRA - PZ4-KRA”) as shown in the figure using the special cylinders (“Steel Rod 3 mm”) which allow the parts to slide between them.



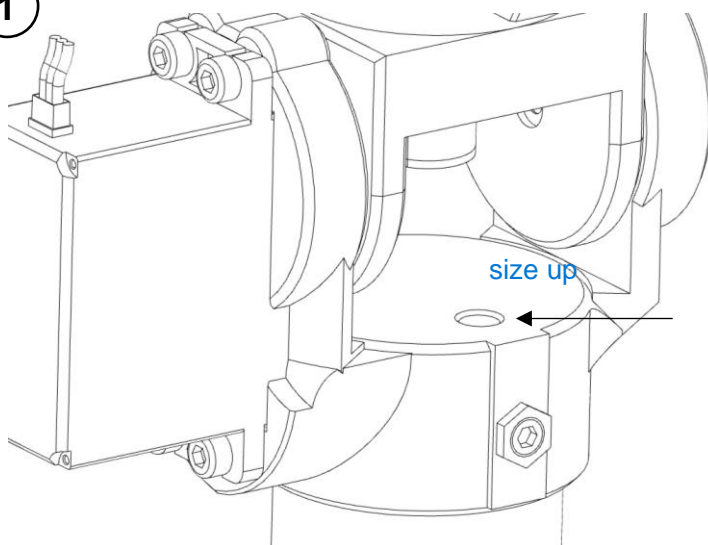
5

Install the last 6 mm rods ("Steel Rod 3 mm") to connect the PZ3 with the PZ5 using the PZ6 ("PZ6-KRA") as shown in the figure.



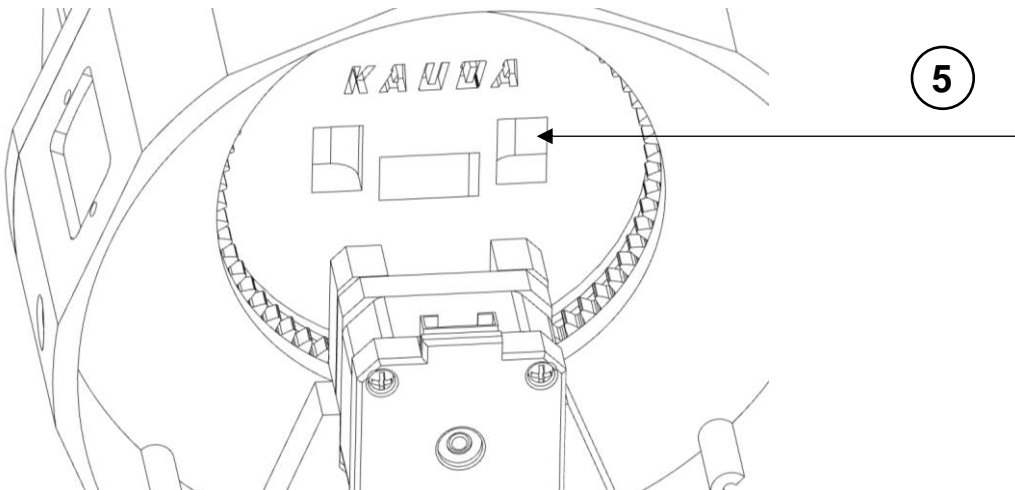
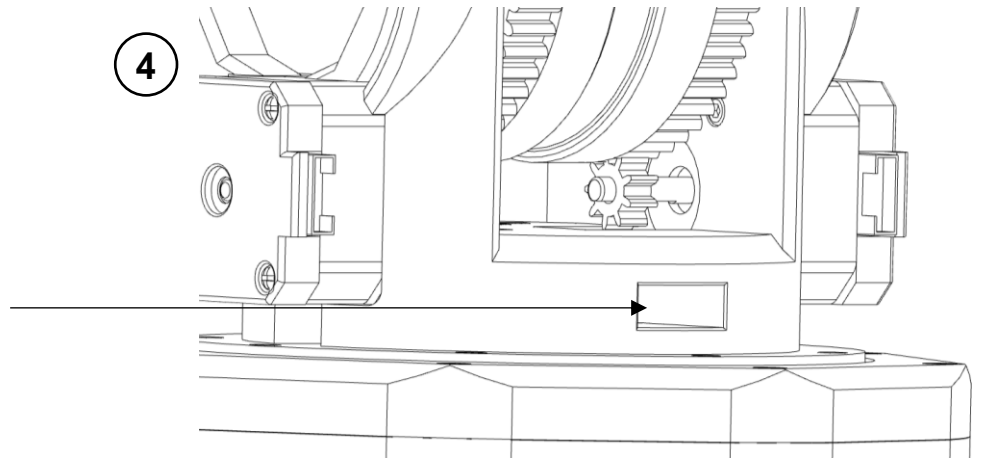
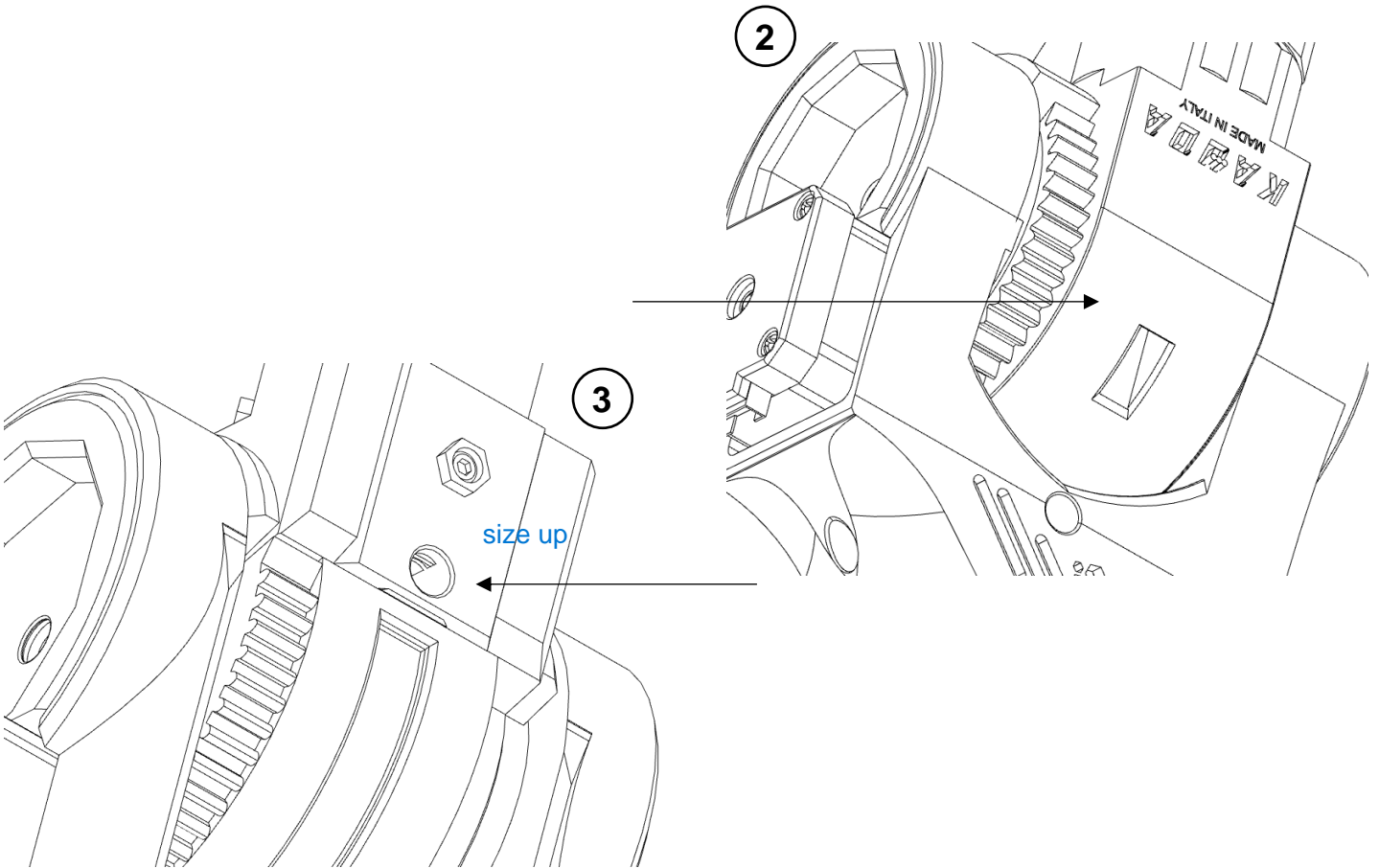
CABLES MANAGEMENT

1



Note:

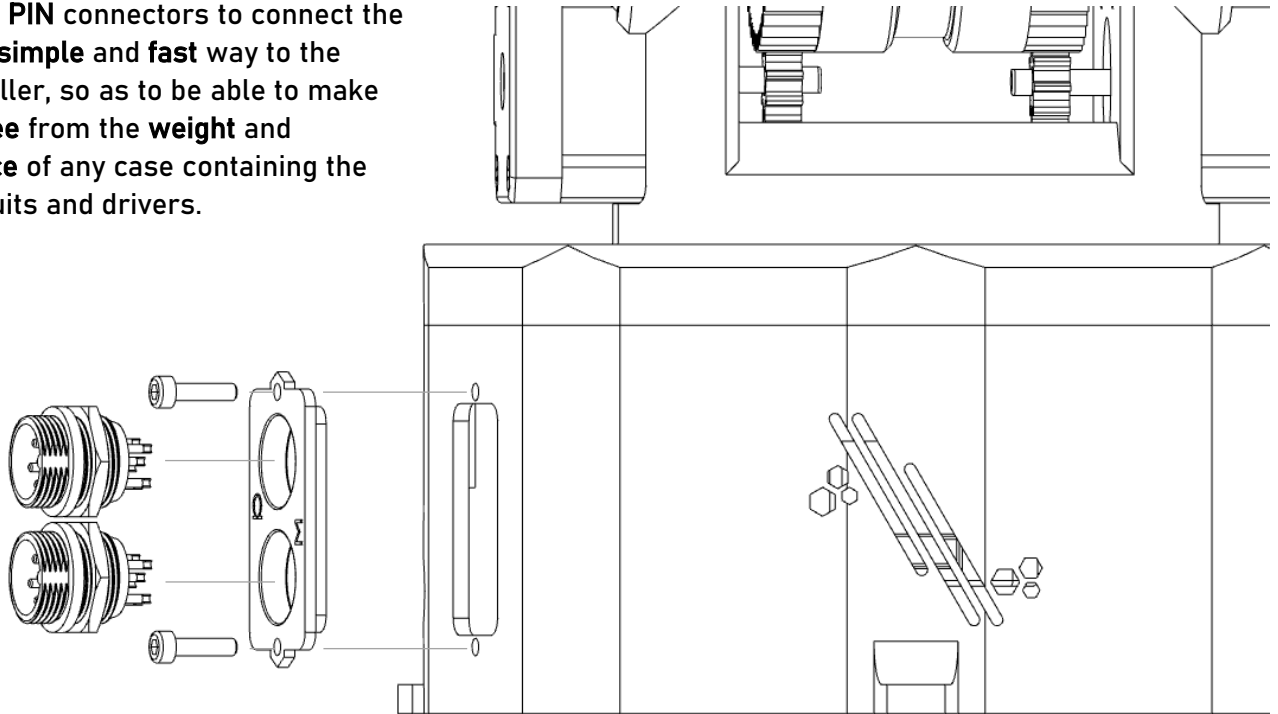
In many components it is possible to find holes and cavities useful for the passage of motor cables, therefore the use is recommended.



CONNECTORS

Note:

It is **recommended** to use the **G16 - 8 PIN** and **G20 - 12 PIN** connectors to connect the motors in a **simple** and **fast** way to the microcontroller, so as to be able to make the robot **free** from the **weight** and **encumbrance** of any case containing the control circuits and drivers.



- 1 Connect the component ("DR-2-KRA") on Base with the M3x 10 screws as in the picture.

Insert the connectors as shown in the picture.

Note:

It is **necessary** to solder the motor cables to the ends of the connectors.

weird note