HI

MACRO YARN MACHINE

Index

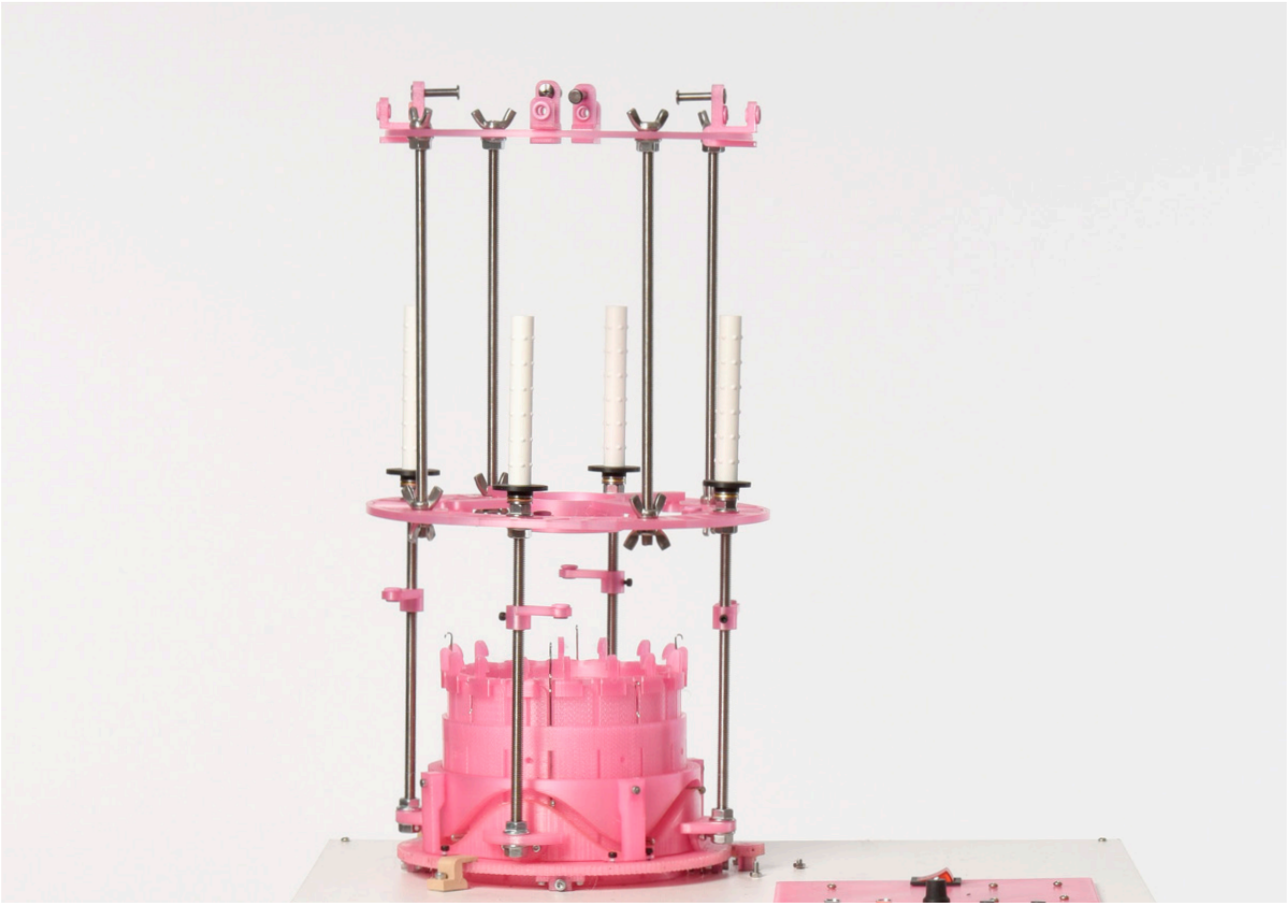
INTRODUCTION

What is it?

THE MACRO YARN MACHINE

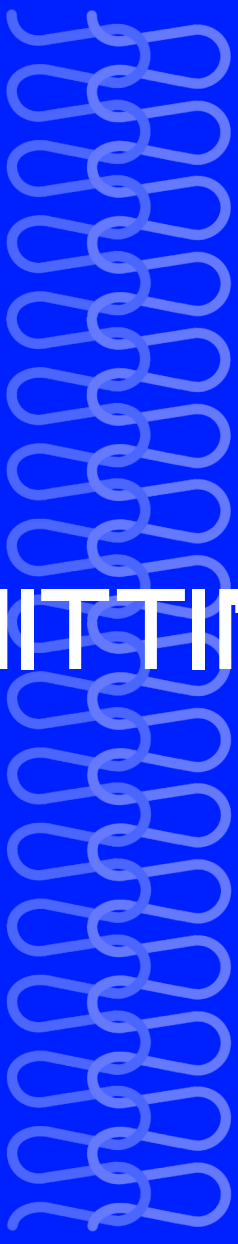
The Macro Yarn Machine is an open-source textile fabrication tool designed for macro yarn's production. The machine is able to knit around a core material and use multiple yarns in one row.

The version described here is a further development and experimention starting from "Macro Yarn Machine" by Jasmin Martinez, 2024.



"Macro Yarn Machine" by Jasmin Martinez, 2024

KNITTING

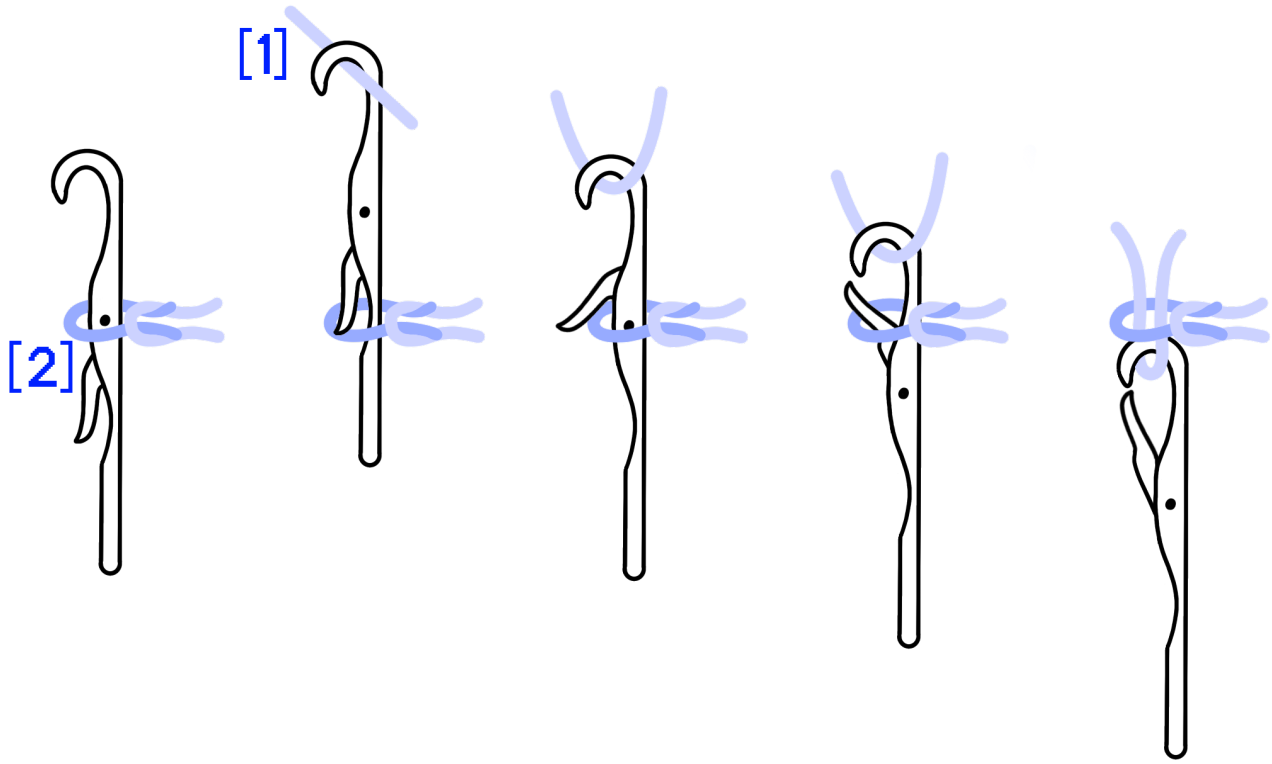


The process

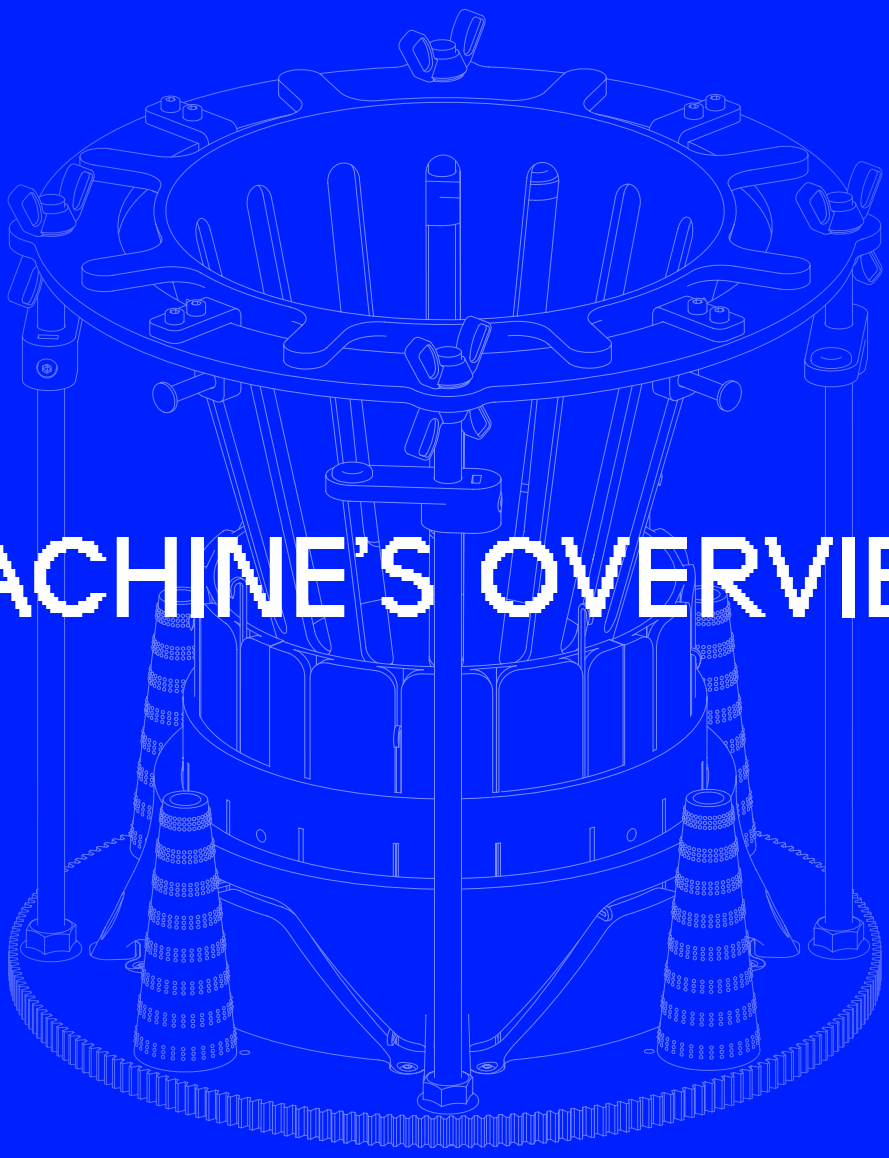
KNITTING MACHINE NEEDLES

The Macro Yarn Machine is a textile tool that process the yarns into knitted structures. Knitting is a process that works by forming loops of yarn and passing them through each other.

Knitting machine's needle works thanks to their vertical movement and a tension system. While going up the needle grabs the yarn [1] and the previous loop [2] slides under the toungue. While going down the tongue closes because [2], being under it, creates a tension. The loop [2] slides over the hook while a new loop is created from [1].



Having acknoledged how the knitting process works, lets take a look on how the Macro Yarn Machine actually functions.



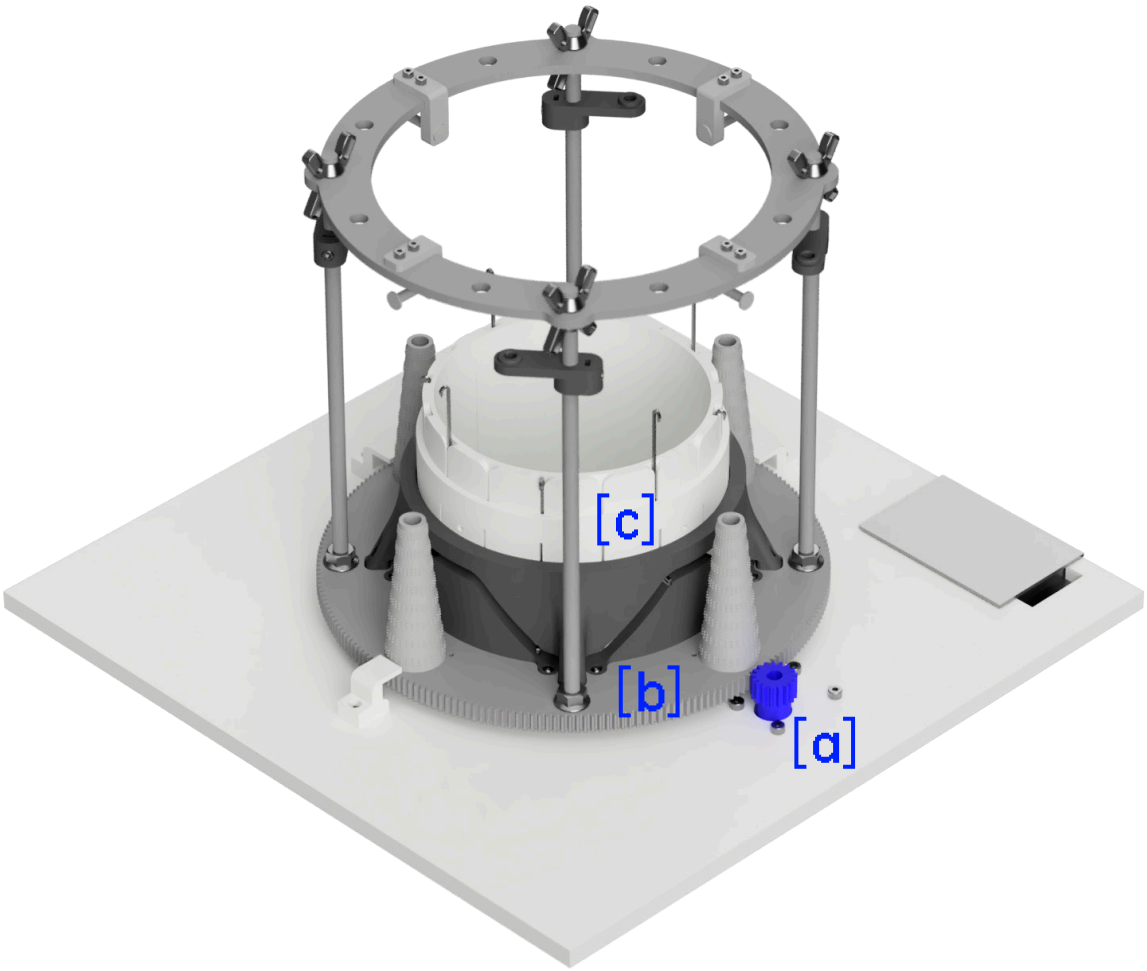
MACHINE'S OVERVIEW

How does it work?

THE DRIVING MOVEMENT

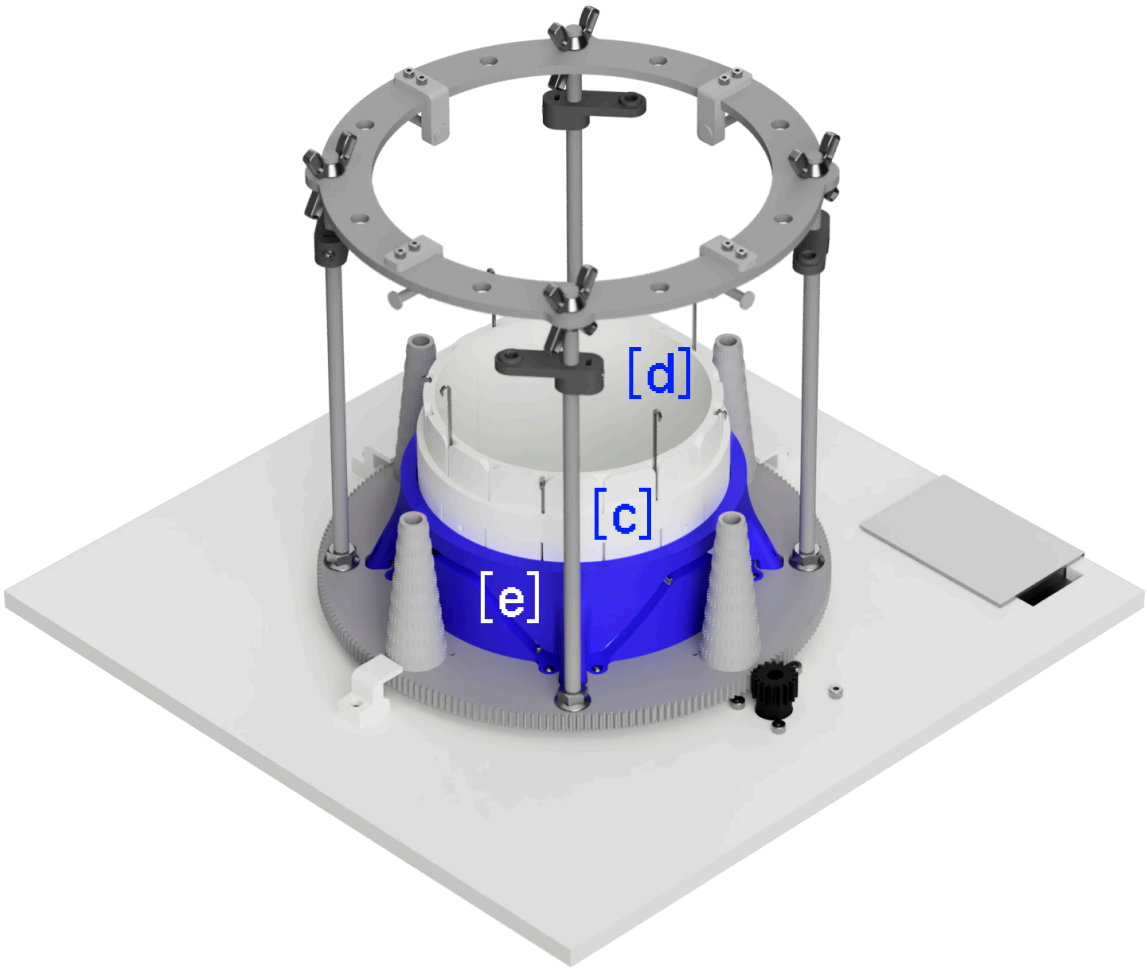
The first things to acknowledge in order to understand the functioning are the movements involved.

The gear [a], connected to the motor, makes the gear [b] rotating. Since the whole machine is assembled on [b] except the cylinder group [c] which is fixed on the table, the machine rotates around [c].

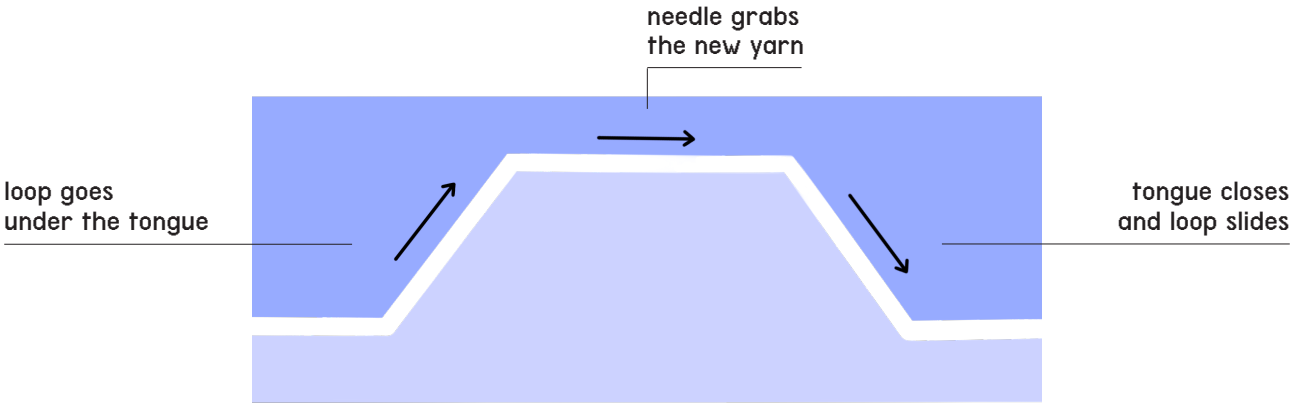


THE NEEDLE GUIDE

Now, by taking a closer look to the needle guide, it's possible to catch how the rotation becomes the needle's vertical movement, pivotal for knitting.

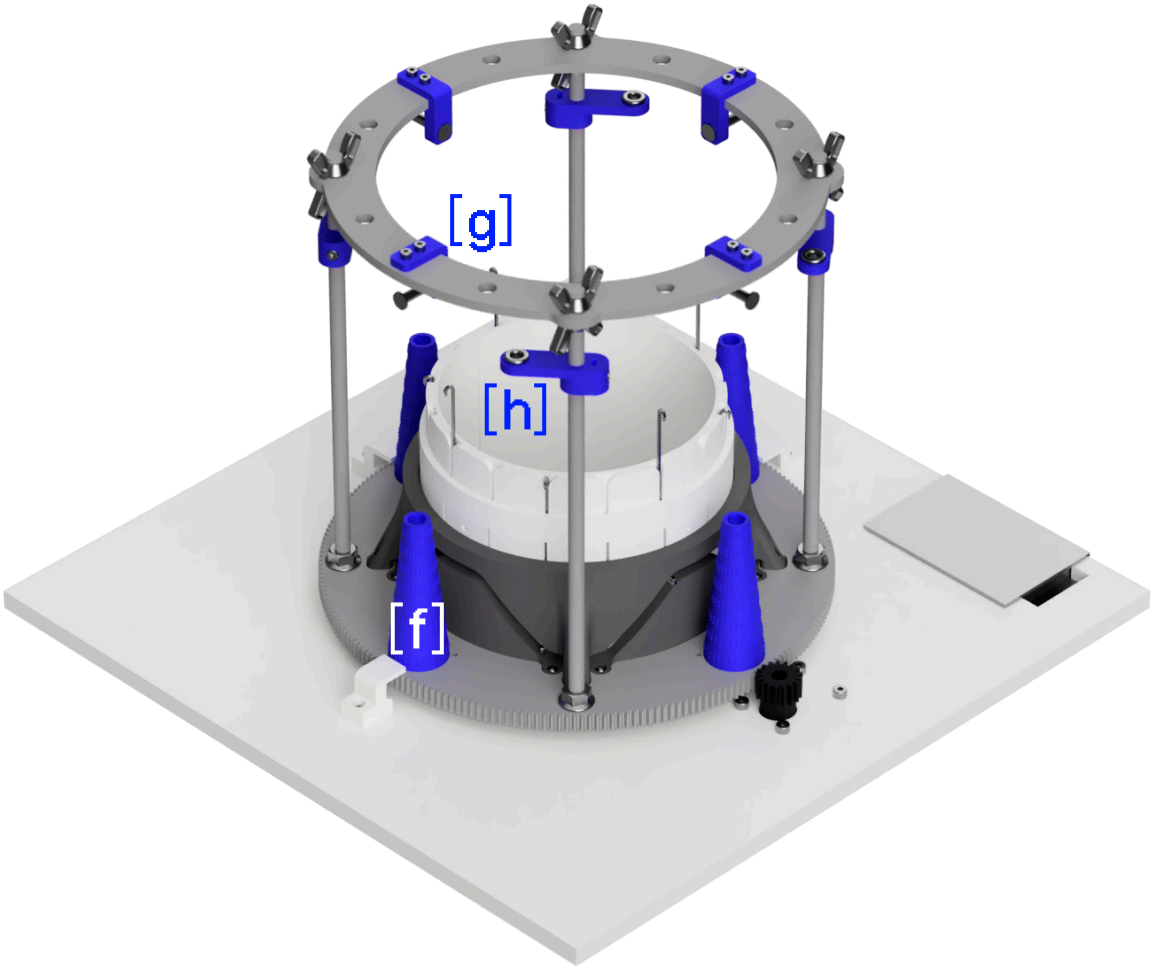


The needles [d], which are free to move vertically but constrained in their slot in the stationary cylinder group [c], are forced by the path on the needle guide [e] to move up and down.



THE YARN'S FEEDING

The machine features a four yarns' feeding system complemented by a tensioning system, that ensures a continuous knitting process.



Fours spools [f], placed on the gear, are used to supply yarn. Each of them feeds through a top tensioner [g] that regulates the yarn tension, and then through a bottom tensioner [h], on the rod, which redirects the yarn's feeding.

BUILDING GUIDE

Manufacturing

3D PRINTING

The machine is mainly 3D printed.
In the table you can find name and quantity of the components. At this link you can download the .stl files and here you can access to the Fusion files to modify the drawings.

Part	Quantity
Gear	1
Funnel	1
Top layer	1
Motor gear	1
Outer cylinder	1
Down needle guide	1
Top needle guide	1
Bracket	3
Spool	4
Inner cylinder	4
Tensioner bottom	4
Tensioner top	4
Bearing holder	4

LASER CUT

The machine is placed on a board pivotal for the final assembly. You can either laser cut it or build it yuorself based on your needs. At this link you can download the .dxf file useful for the laser cutting and the fusion file to customize it. In case of manual building, place the machine on the board and use the OuterCylinder to draw the holes of the screws and hole.

Buy components

HARDWARE AND ELECTRONICS

In the table below you can find all the hardware and electronics you need to build the machine. You can find everything online or in local shops (check out the suggested links for the electronics).

Part	Description	Quantity
Threaded Rod	M8x250mm	8
Wing Nut	M8	8
Flange Nut	M8	4
Nut	M8	4
Needle	Brother KH230	8
Book Screw	M5x24mm	4
Ceramic Eyelet	5mm	4
Deep Groove Ball Bearings	4x9x4mm	8
Internal Hex Screw	M4x 20mm	4
	M4x16mm	4
Nut	M4	4
Wood Screw	M3x12mm	3
Internal Hex Screw	M3x12mm	4
	M3x8mm	24
Hex Socket Button Screw	M3x8mm	8
Nut	M3	24
Wood Screw	M2x12mm	8
Screen	amazon link	1
Motor	250rpm 24 V amazon	1
Power supply	amazon link	1
Wiring cables		/
Pre-ensulated ring terminal		4

Electronics preparation

CABLE PREPARATION

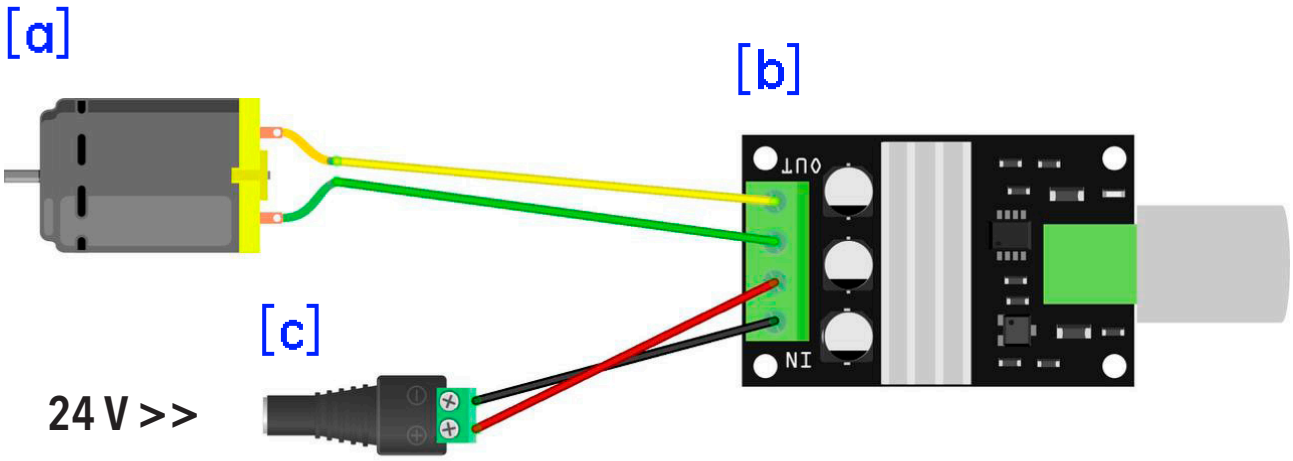
Take the wiring cables and cut one red and one black in the same lenght. Being the interaction with the screen via screws, to have strong connections it is reccomended to add pre-insulated ring terminals at the cables' ends. Proceed both with cables coming from the motor and the ones you just cutted.

link / pictures

CONNECTIONS

The schematics below shows how the electronics are supposed to be connected to each other.

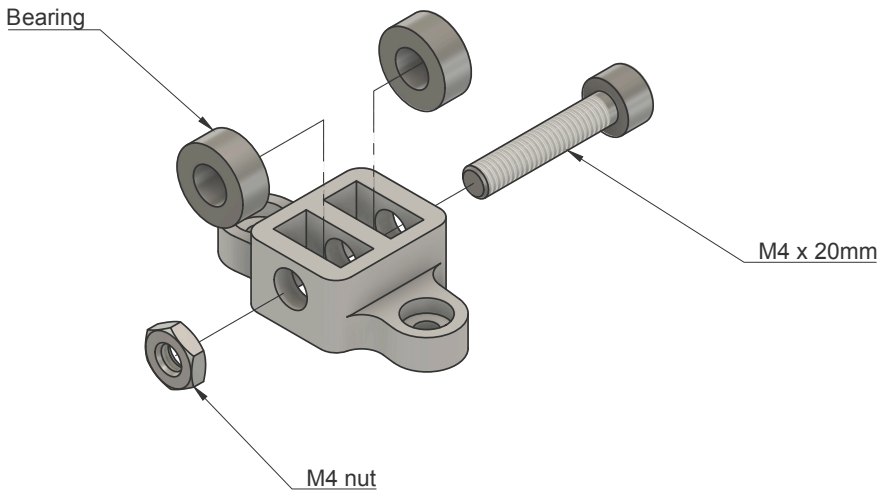
The motor [a] thanks to the cables that come with it, is connected to the screen [b]. The power jack [c] is connected to [b] through the black and red cables that have been prepared in the paragraph before.



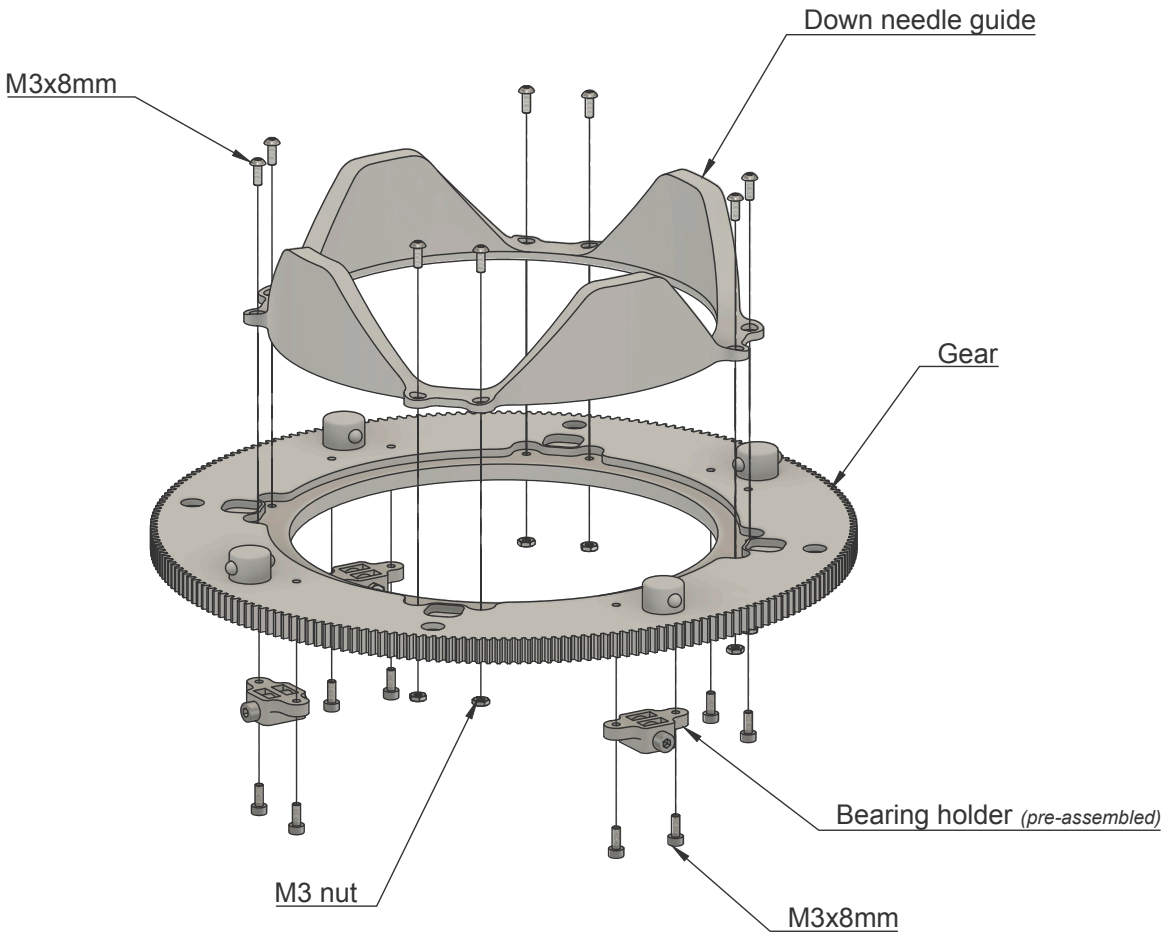
Once this is done, by connecting the power supply to the power jack, the system will work. Through the screen it is possible both to start and stop the motor, but also to control the speed. For efficency purposes, it is suggested to check if the electronic system is working in this phase to avoid having to disassembly the system in a future moment.

Assembly instructions

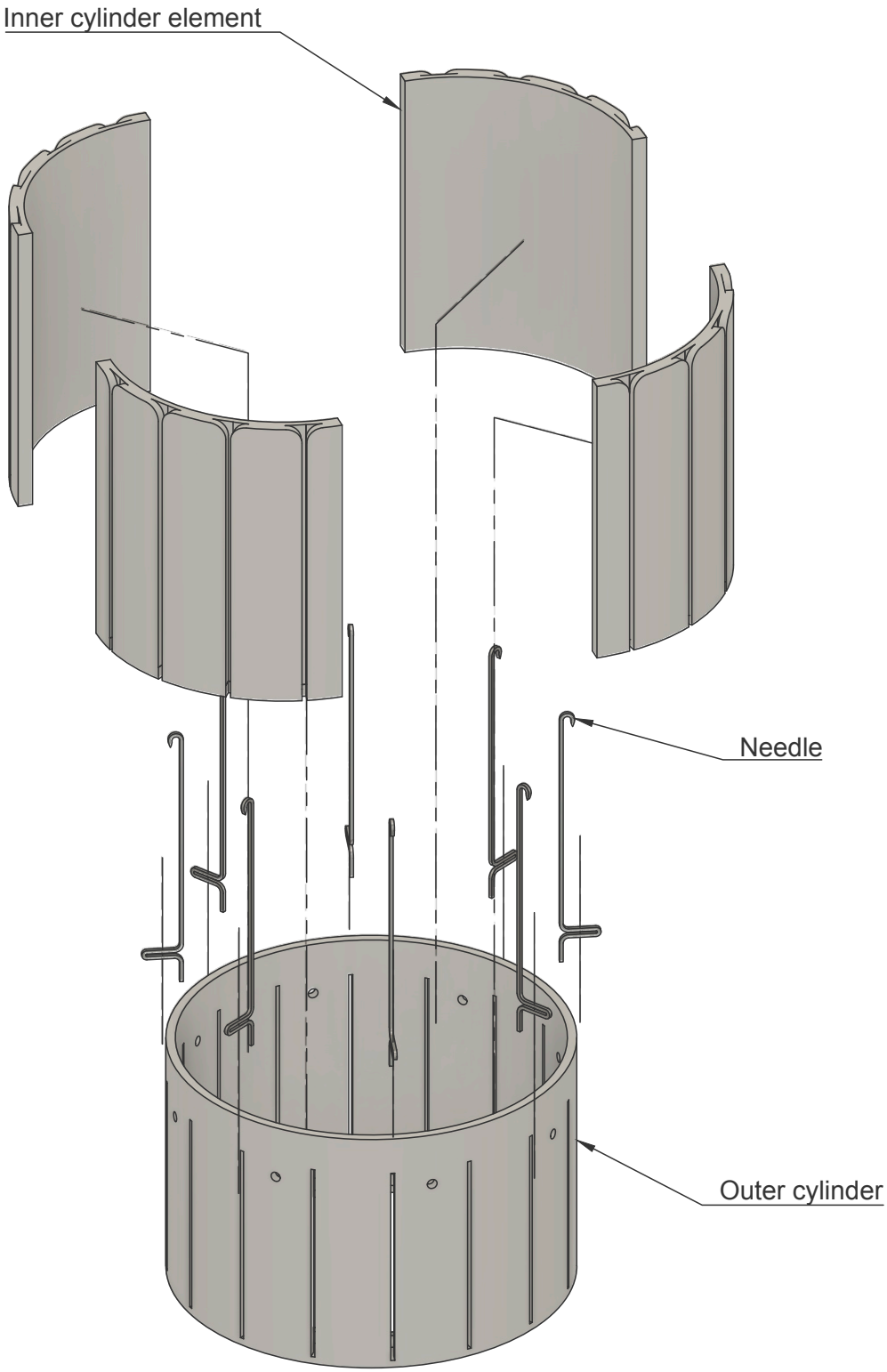
[1] BEARING HOLDER X4



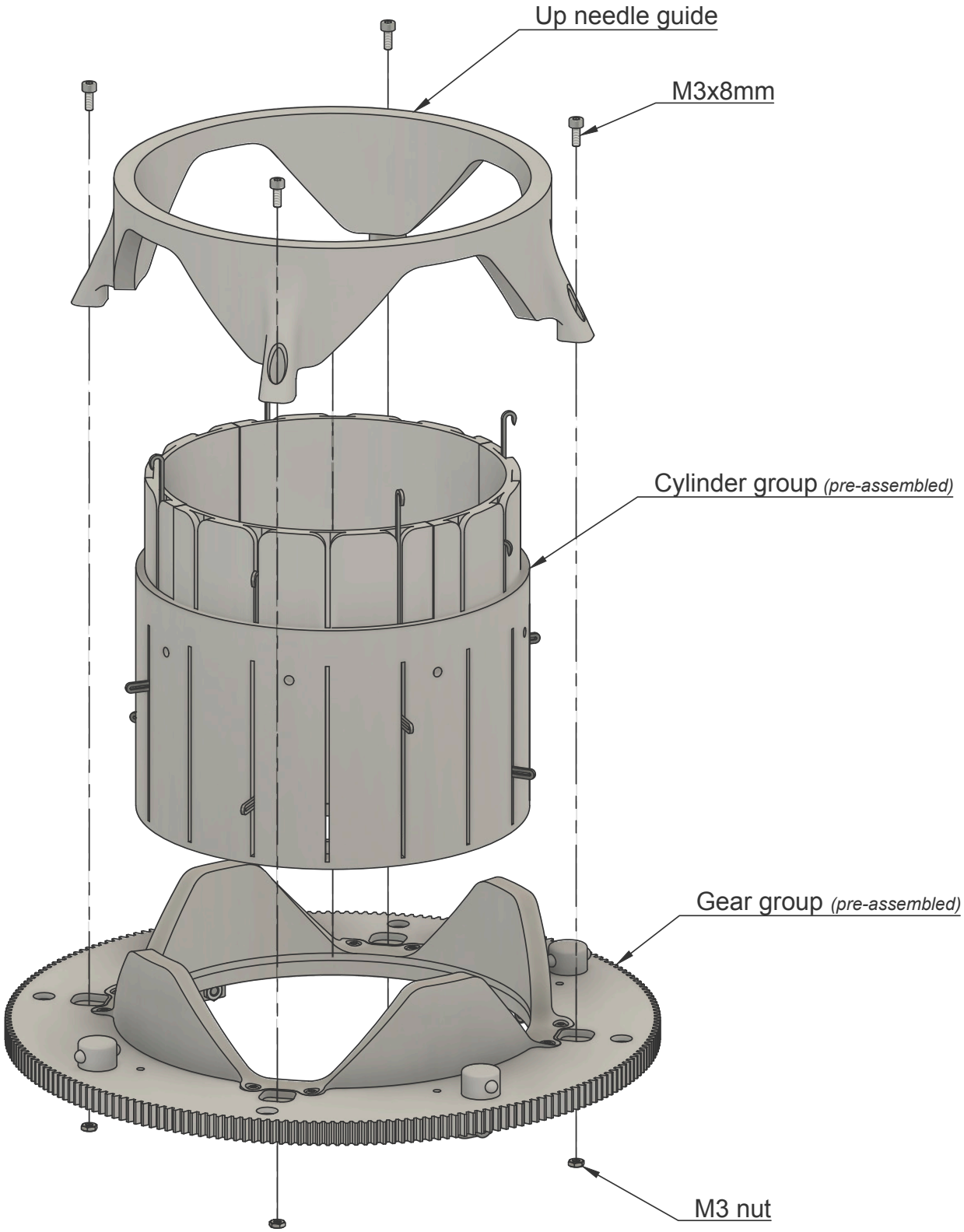
[2] GEAR GROUP



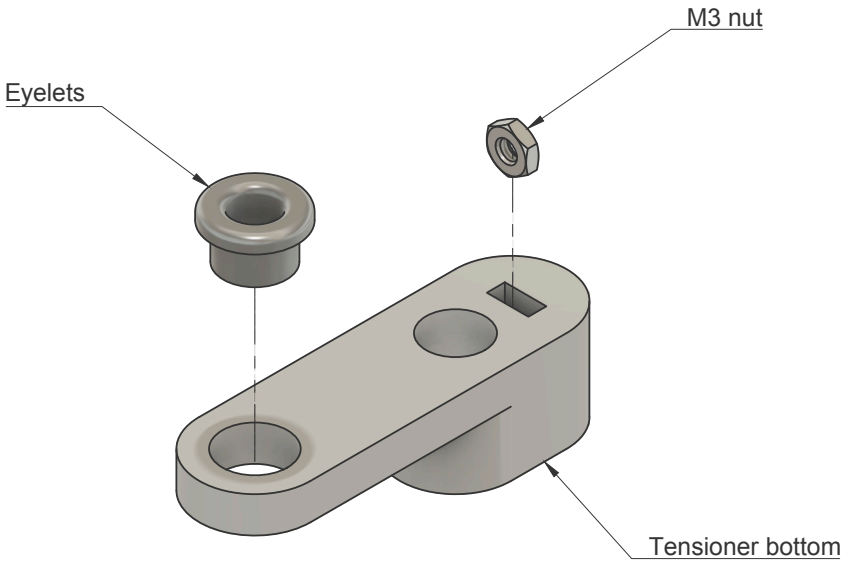
[3] CYLINDER GROUP



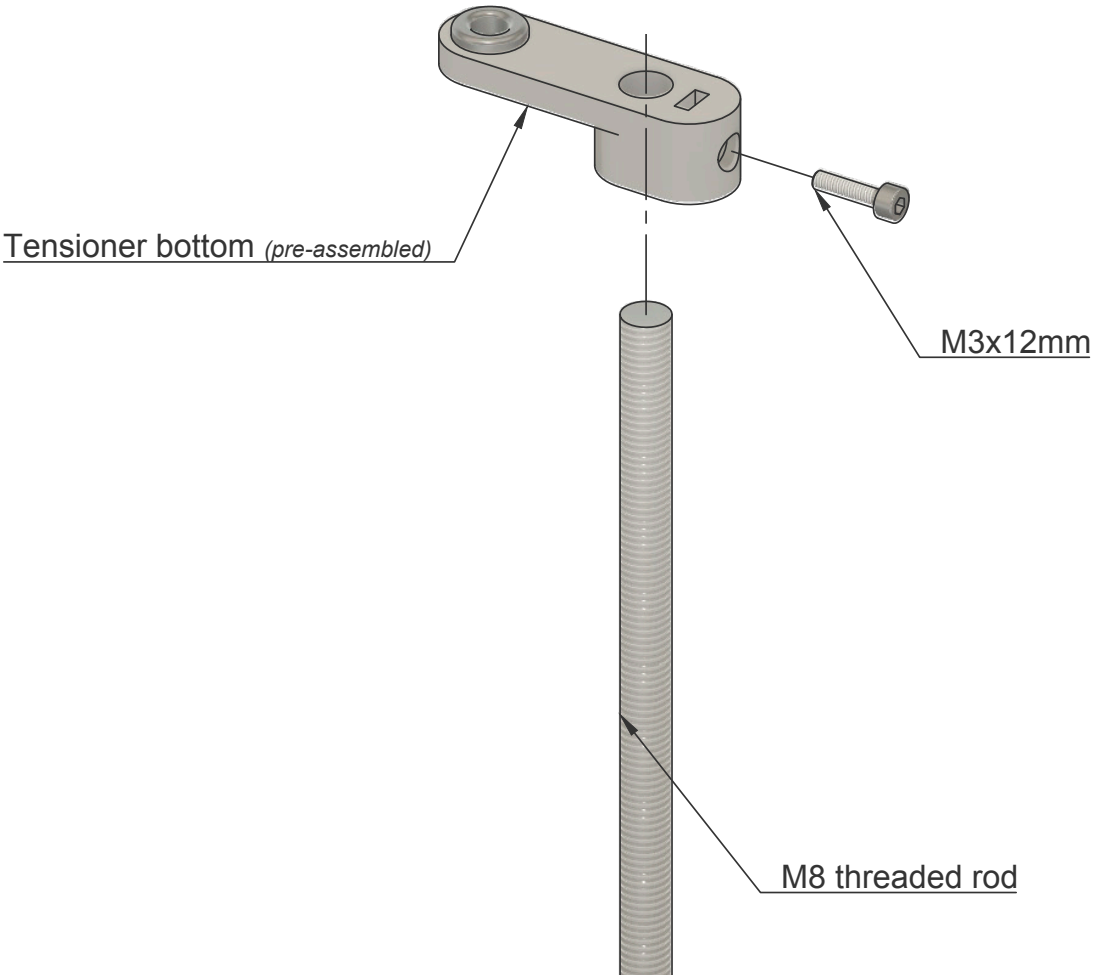
[4] BASE


Up needle guide
M3x8mm
Cylinder group *(pre-assembled)*
Gear group *(pre-assembled)*
M3 nut

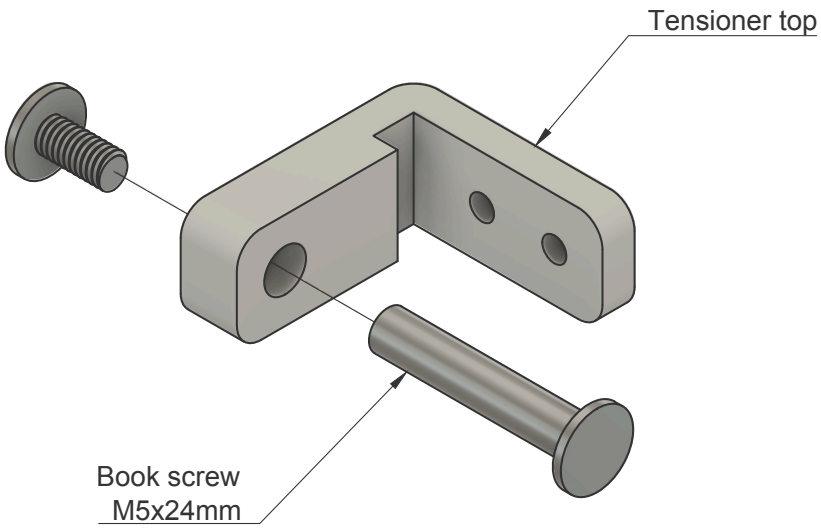
[5] BOTTOM TENSIONER X4



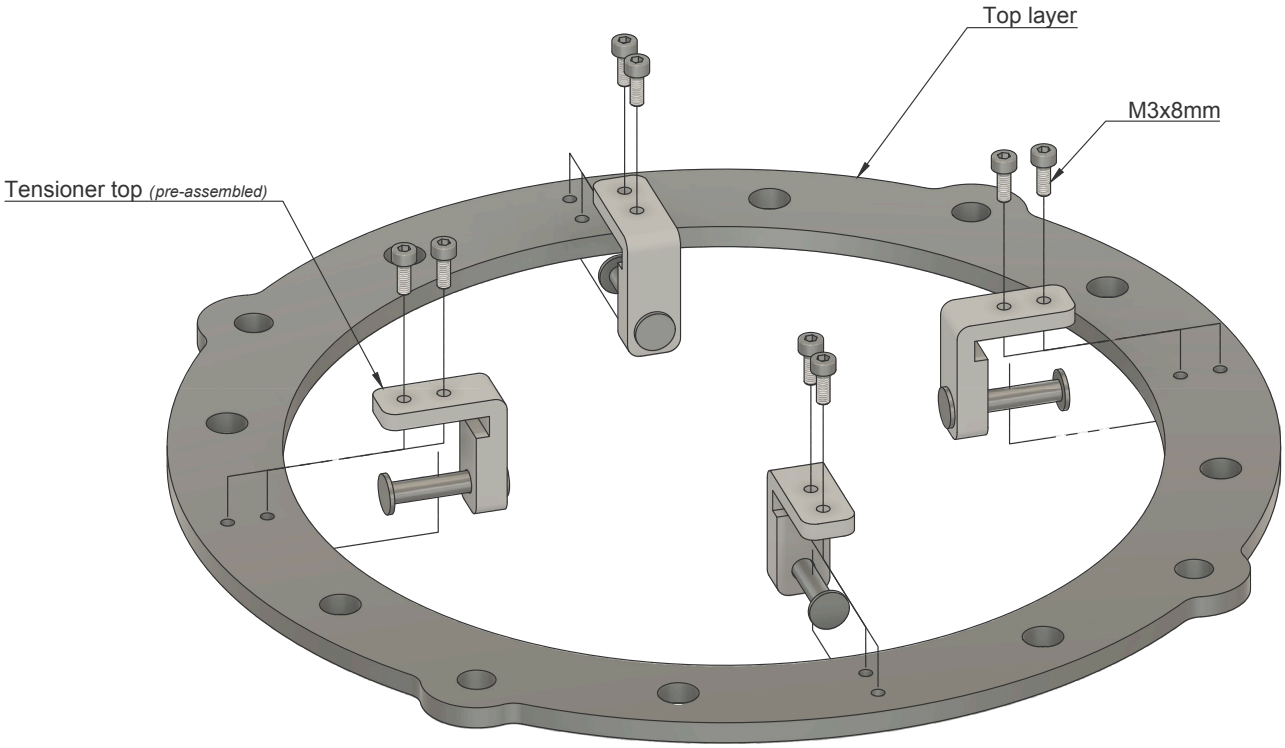
[6] ROD GROUP X4



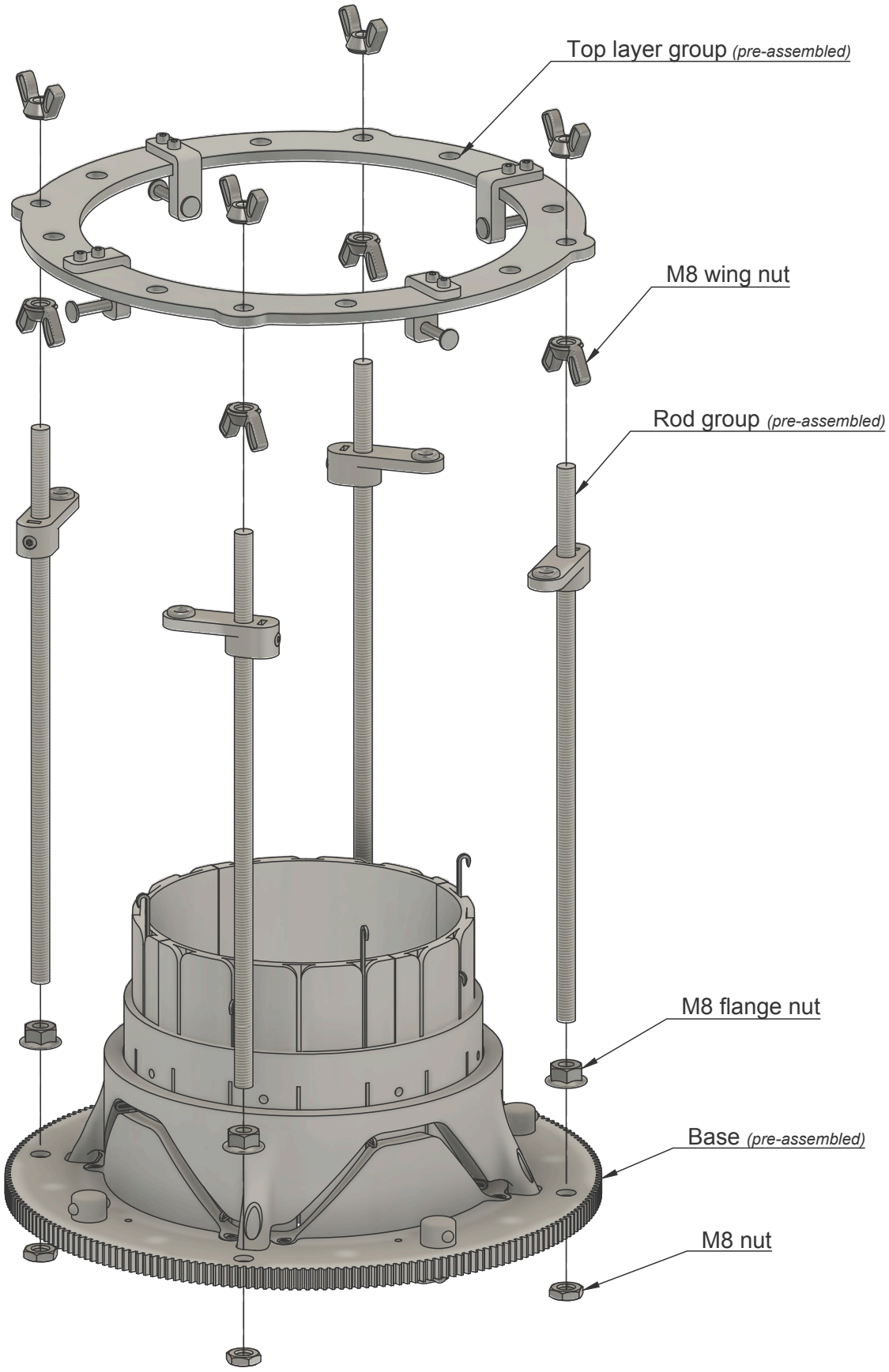
[7] TOP TENSIONER X4



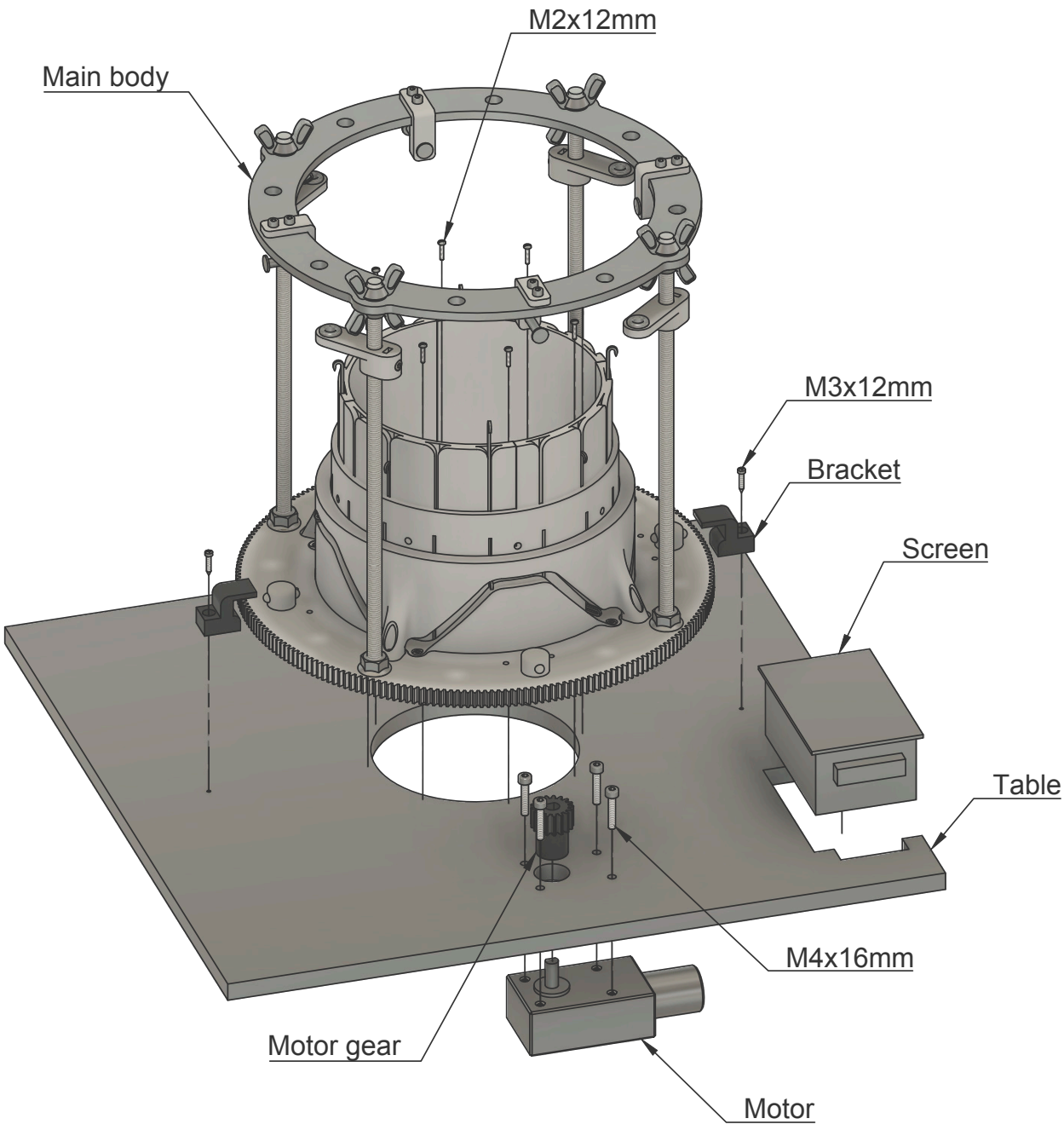
[8] TOP LAYER



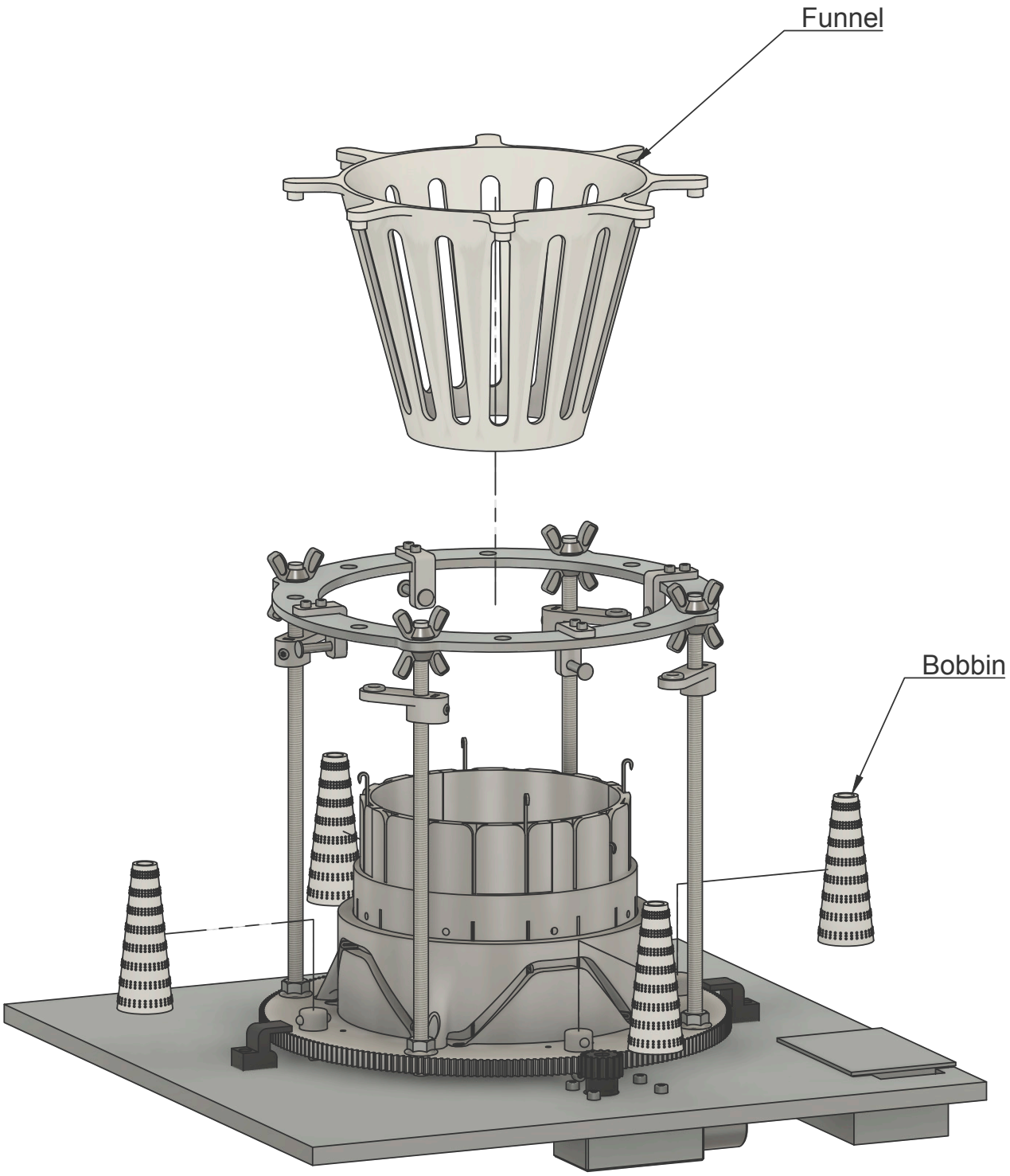
[9] MAIN BODY


Top layer group (pre-assembled)
M8 wing nut
Rod group (pre-assembled)
M8 flange nut
Base (pre-assembled)
M8 nut

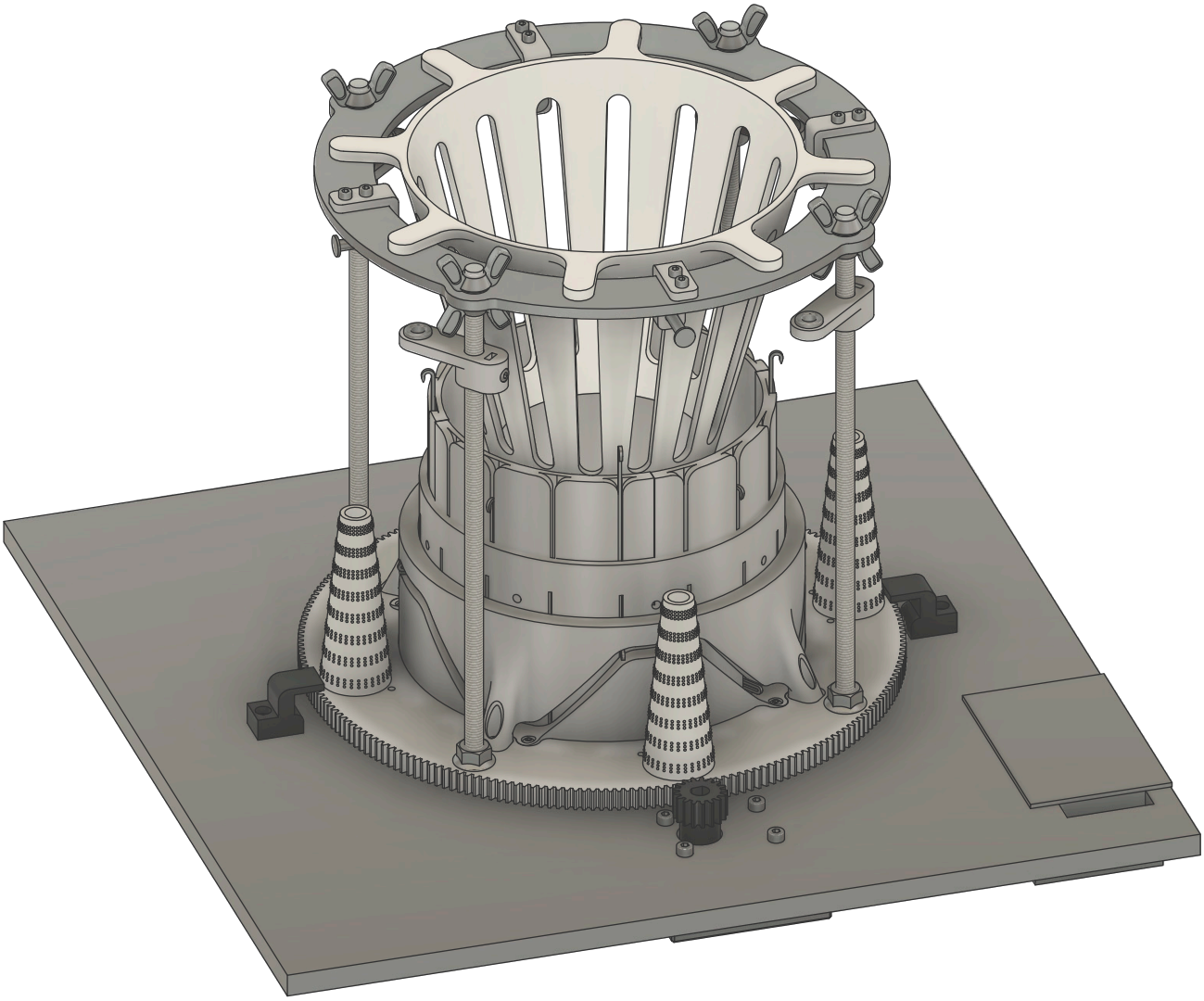
[10] TABLE


M2x12mm
Main body
M3x12mm
Bracket
Screen
Table
M4x16mm
Motor gear
Motor

[11] USAGE SET-UP



RESULT !

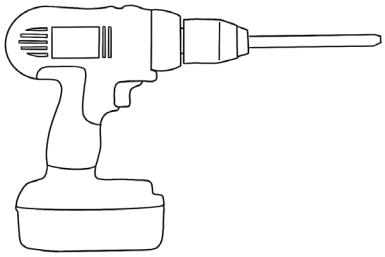


USING THE MACHINE

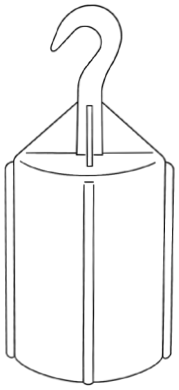
Preparation

USEFUL TOOLS

Before starting to setting up and using the machine it is suggested to prepare the working station in order to have a smooth process. There are a couple of tools that, from the spool's winding to the actual usage of the machine, that might help you throughout the process.



DRILL
Useful for a quick spool's winding



WEIGHT
Useful to have even tension on the fabric

CROCHET HOOK
Useful for threading and troubleshooting

MATERIAL PREPARATION

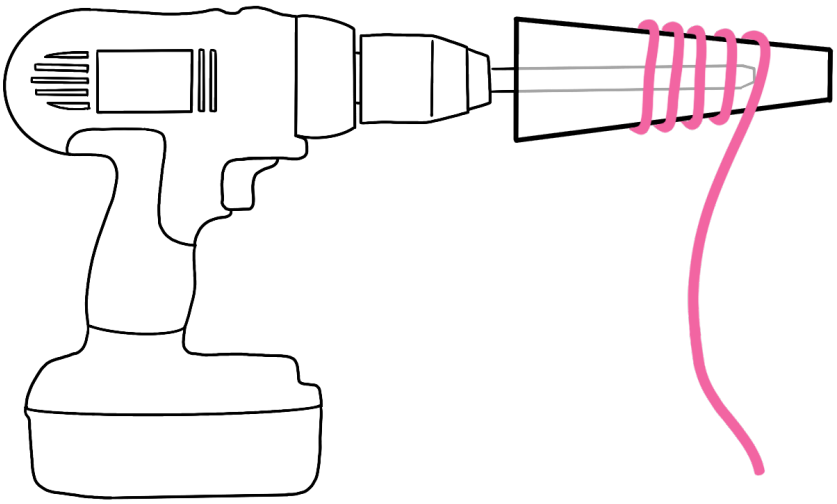
It is also suggested to prepare the material in advance. You will need some yarn to wind onto the pools - feel free to use the same yarn for each, or mix different types and colors as you prefer. If you are planning to create empty structures, no additional material is needed. On the contrary, if you intend to fill them, be sure to prepare the core material as well.

Setting up

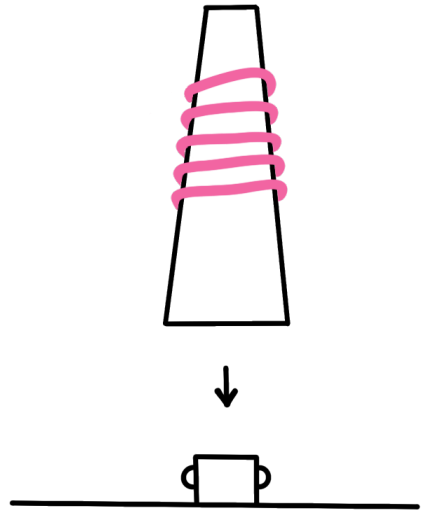
SPOOL PREPARATION

1. Put the spool on a drill bit, use some tape to help it stay in place.
   Use the drill to wind the yarn around the spool.

2. Put the spools on the gear following the twist lock mechanism.



[1]

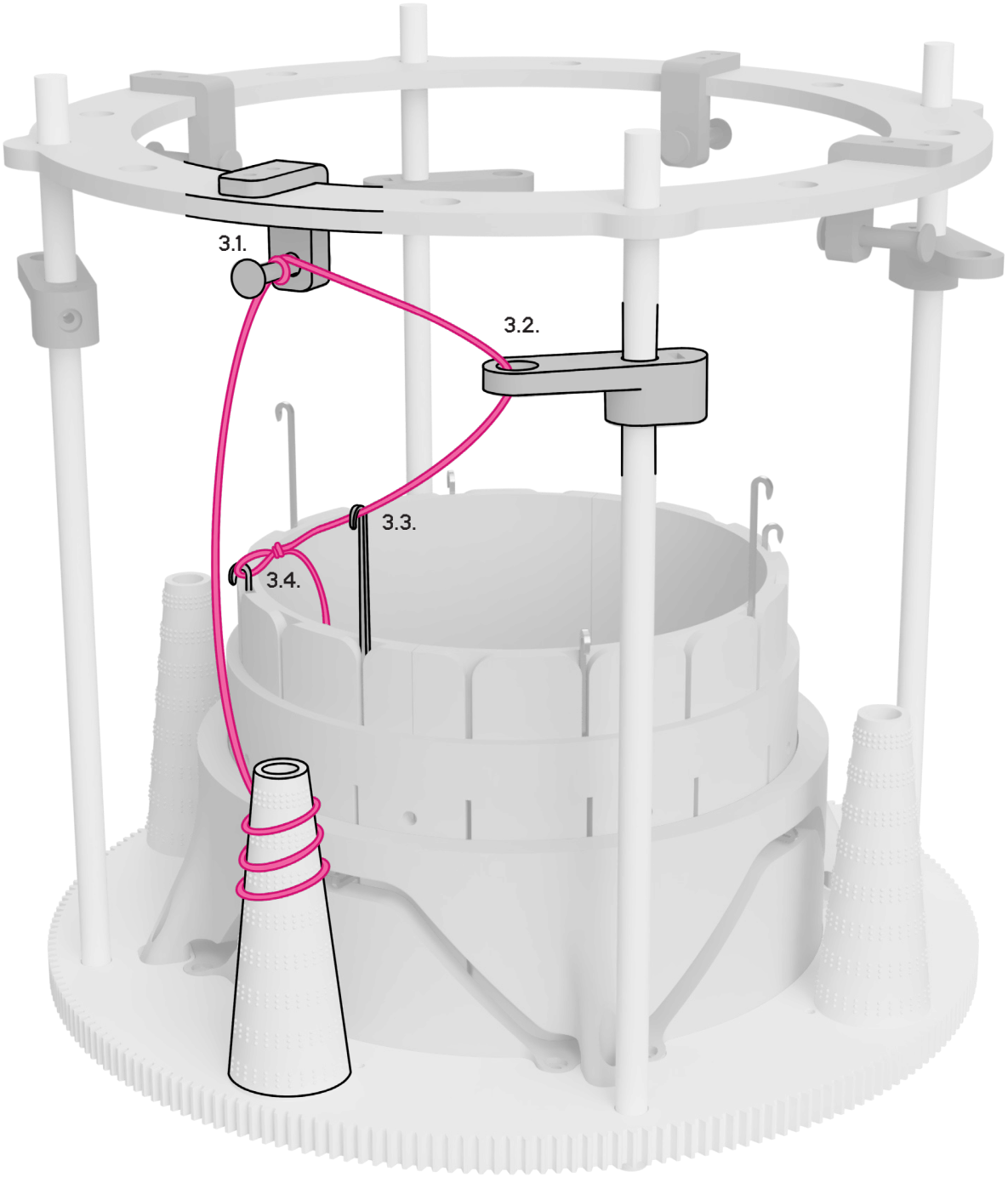


[2]

YARN THREADING

3. Thread the machine following these steps:

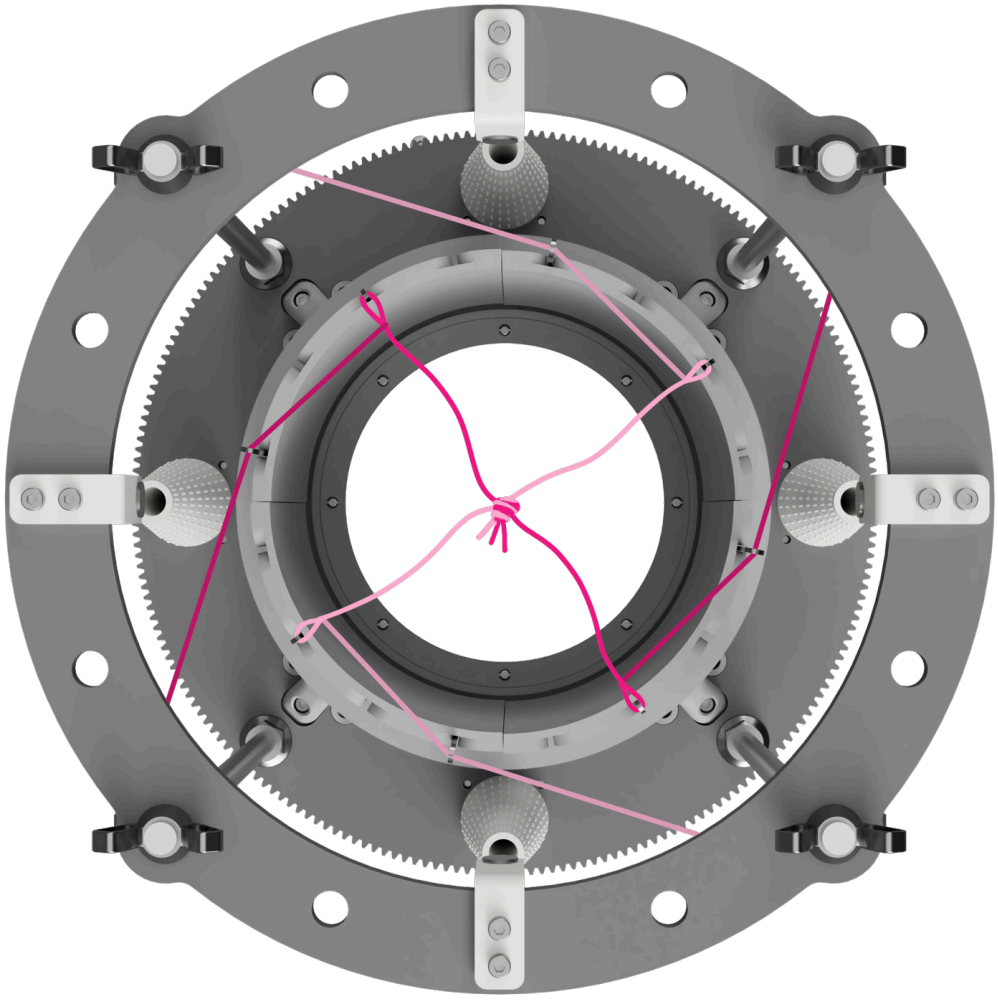
3.1. Guide the yarn to the top tensioner
3.2. Go through the bottom tensioner
3.3. Guide the yarn under the taller needle's hook
3.4. Make a non-slip knot on the shorter needle on the left



[3]

FINAL KNOT

4. After repeating the threading for each spool, take the four ends coming from the loop knots and knot them together. Make sure to keep the same distance from each loop so that the knot is centered on the cylinder.



[4]

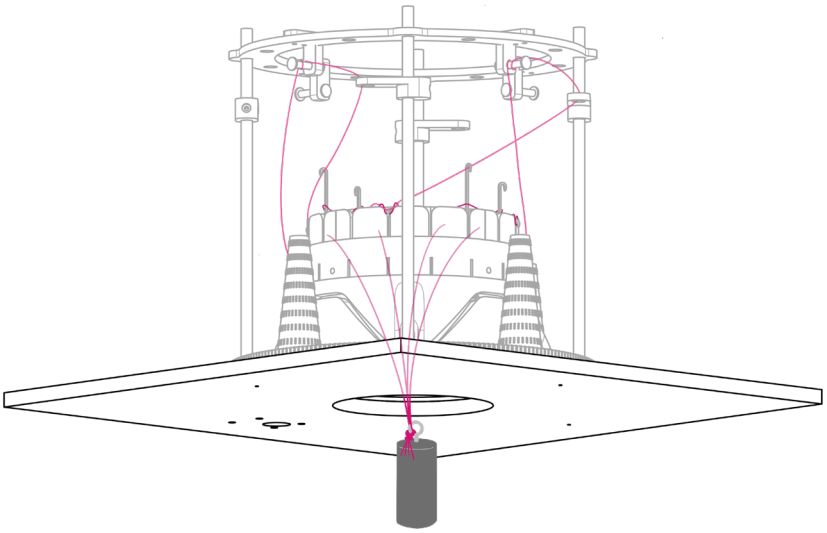
Starting the session

FIRST ROUNDS

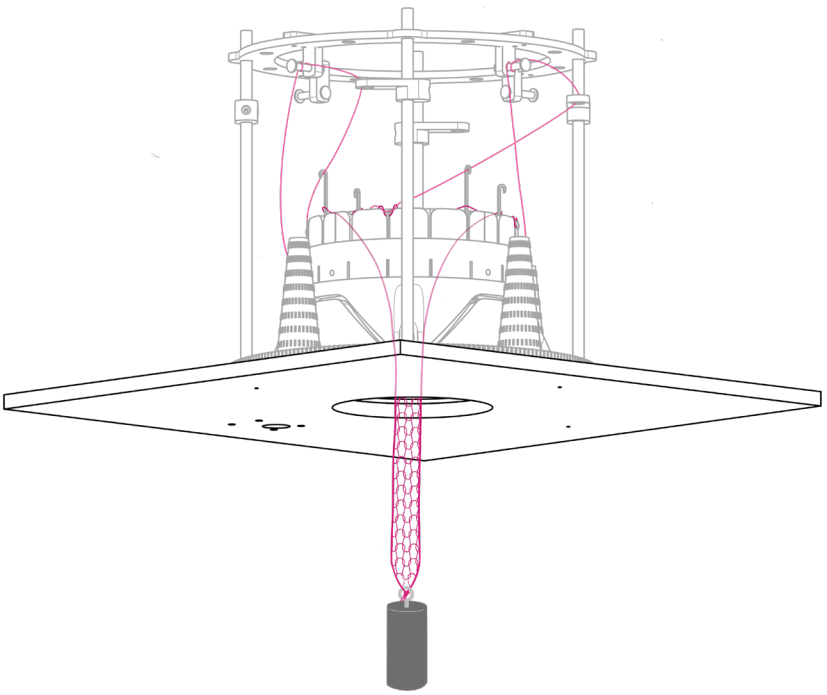
5. Put a weight on the knot that connects the four yarns. Make sure the yarn is tensioned in all the steps, from the spool, going through the tensioners.

6. Being the first rounds crucial, start by turning the machine by hand. After a few successful rounds, attach the motor gear and start the machine.

[5]

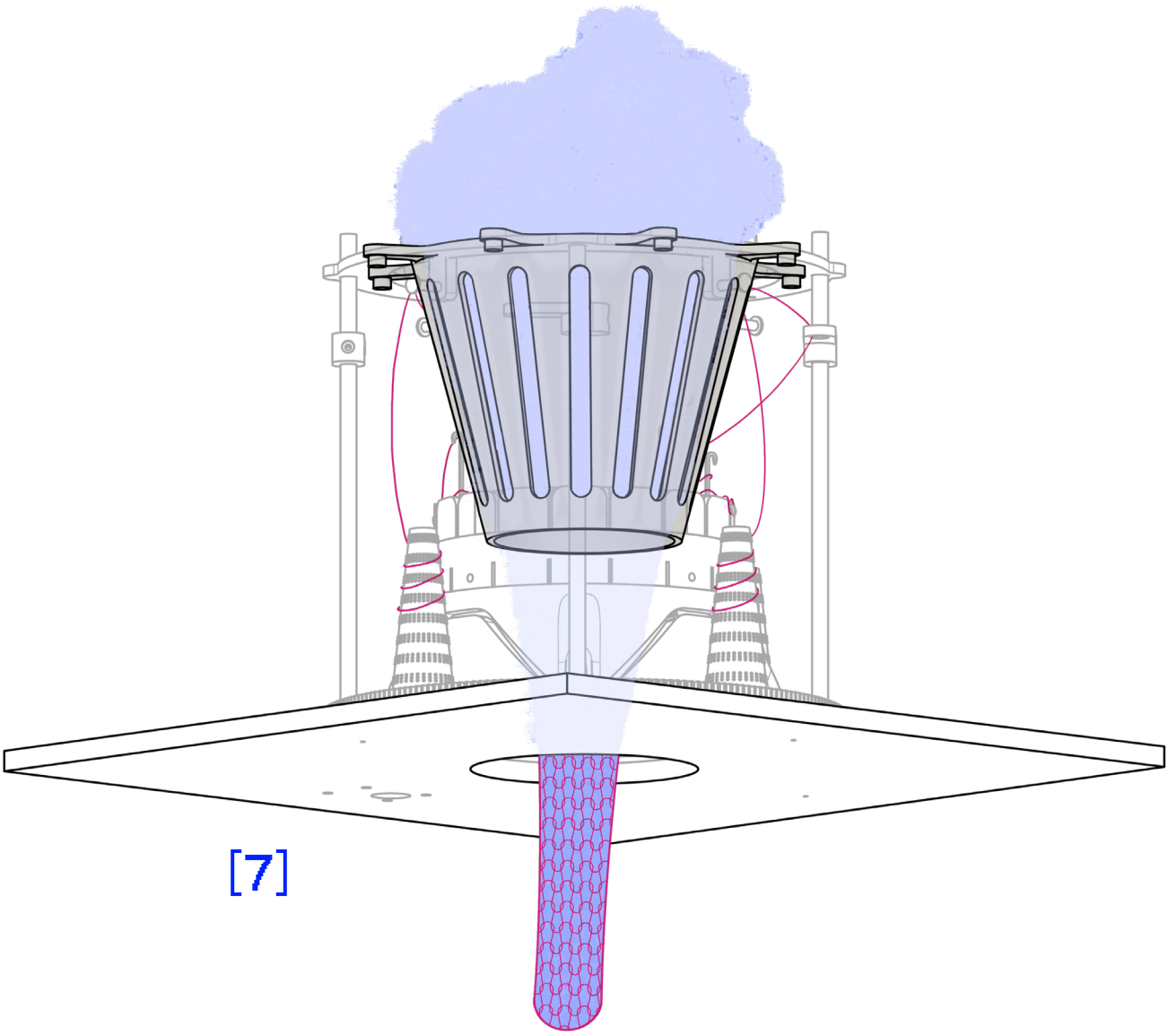


[6]



CORE FEEDING

7. If you haven't already done it, add the funnel on the top layer. While the machine is in stop mode, place the core material in the funnel making sure that it doesn't push too much on the knitted structure. Start the machine and gently guide the core. Make sure that the material gets in the knitted tube and hold it to play with its tension.



[7]

If you use the machine with the core feeding it is possible that the weight is not necessary. Depending on the nature of the core, its own mass could be enough to keep the needed tension.

Closing the structure

TROUBLESHOOTING

What if?

PROBLEM-SOLUTION

In the table below you can find some common issues and a way to solve them.

	Problem	Possible reason	Solution
1.	The needle doesn't grab the yarn coming from the bottom tensioners	The bottom tensioner is not at the right height/angle	Check the bottom tensioners' position
		The yarn is not enough tensioned	Make sure the yarn is enough tensioned
2.	The machine looses loops	The needles are not grabbing the yarn	Go to Solution 1. and then try to get back the lost loop to continue knitting
3.	The machine doesn't turn properly	The electronic is not functioning	Check and adjust the electronic connections
		The motor gear is too distant from the mym's gear	Move the motor gear closer to the machine
		There is friction between the needles and the neddle guide	Put grase on the needle guide

To keep in mind

VARIABLES AND PRECAUTIONS

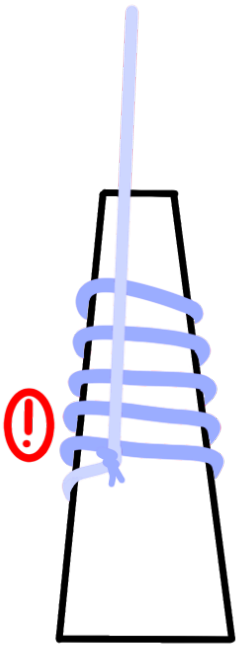
Being the machine in a continuous development process, minor issues may occur. To avoid them, be mindful of its sensitivity and minimize unpredictable variables. Here some tip on how to avoid complications:

[1] **Spool Winding:**
Avoid knots on the spool. Refill yarn only when the spool is nearly empty as knots can cause the yarn to get stuck and snags and excess tension.

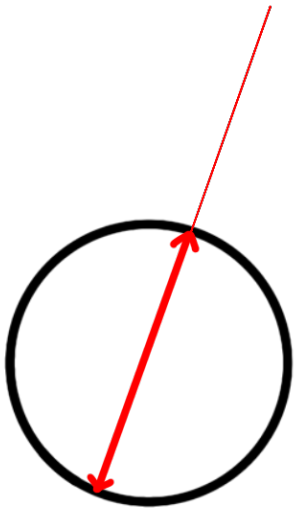
[2] **Core Size:**
Avoid feeding large cores, it could create resistance and therefore, unwanted tension. If experimenting, increase the diameter gradually.

[3] **Bottom Tensioner:**
Adjust their position (height and angle) at the beggining of your session before starting the machine so the needles can properly catch the yarn.

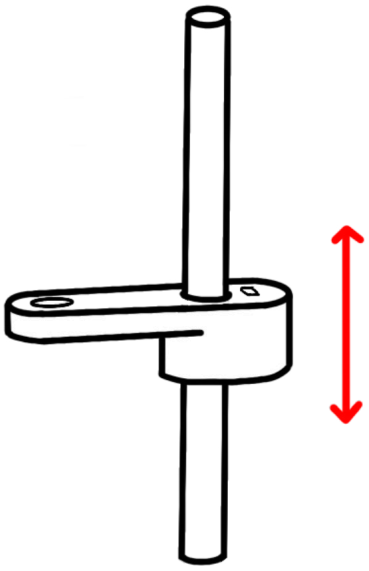
[4] **Weight:**
Be aware that if you change forces mid-session, since it influences the loops' size, the tension system might need to be recalibrated.



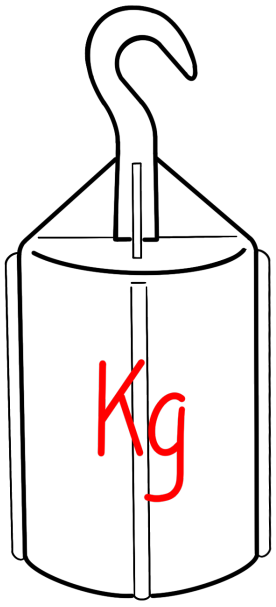
[1] NO KNOTS
ON THE SPOOL



[2] MANAGEABLE
CORE SIZE



[3] ADJUST BOTTOM
TENSIONER



[4] WEIGHT
CONSISTENCY

Train your eyes

FAMILIARIZING WITH THE STRUCTURE

A key strategy to be able to fix problems when they occur is to understand the structure and train your eyes to recognize when something is off.

GETTING BACK A LOST LOOP

Being the machine in a continuous development process, minor issues may occur. To avoid them, be mindful of its sensitivity and minimize unpredictable variables. Here some tip on how to avoid complications:

?? Moss A. Moschen
for HILO Textiles