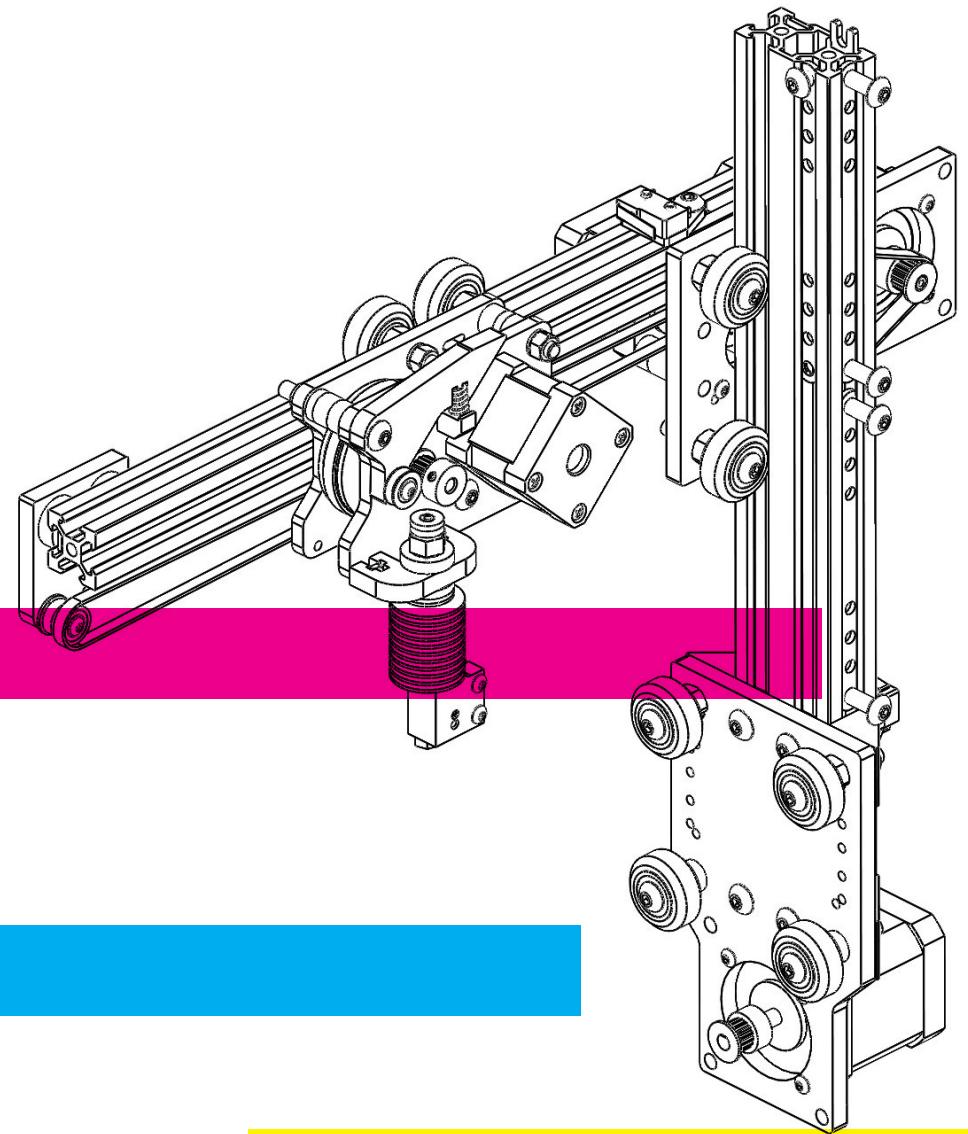


3D Printer Build Manual

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kvit0003@student.monash.edu



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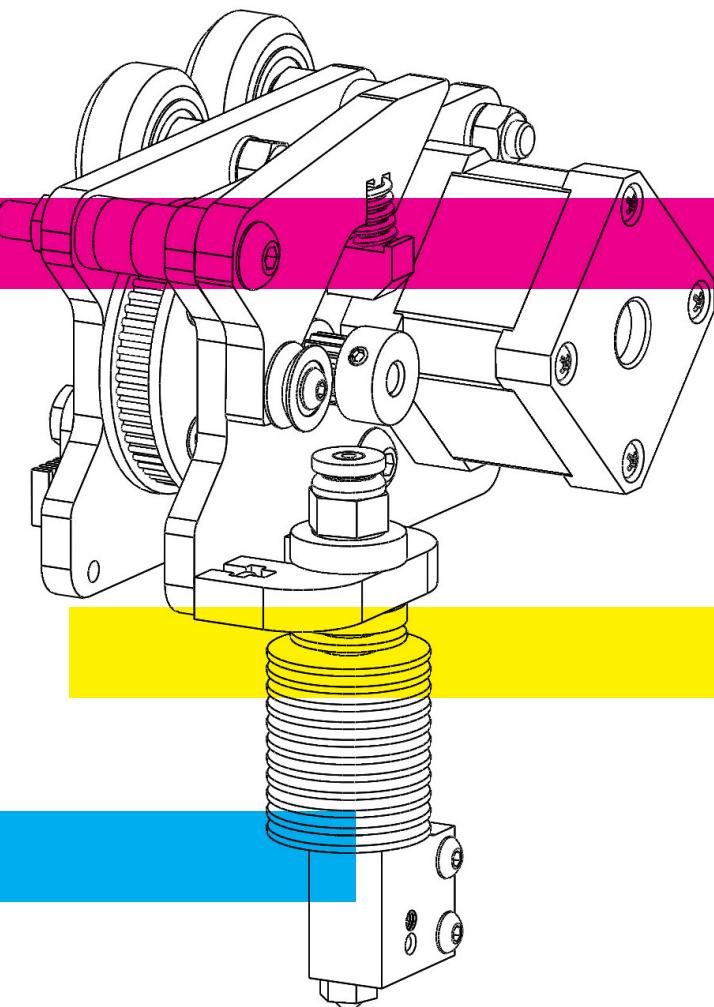
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Part 1: Extruder

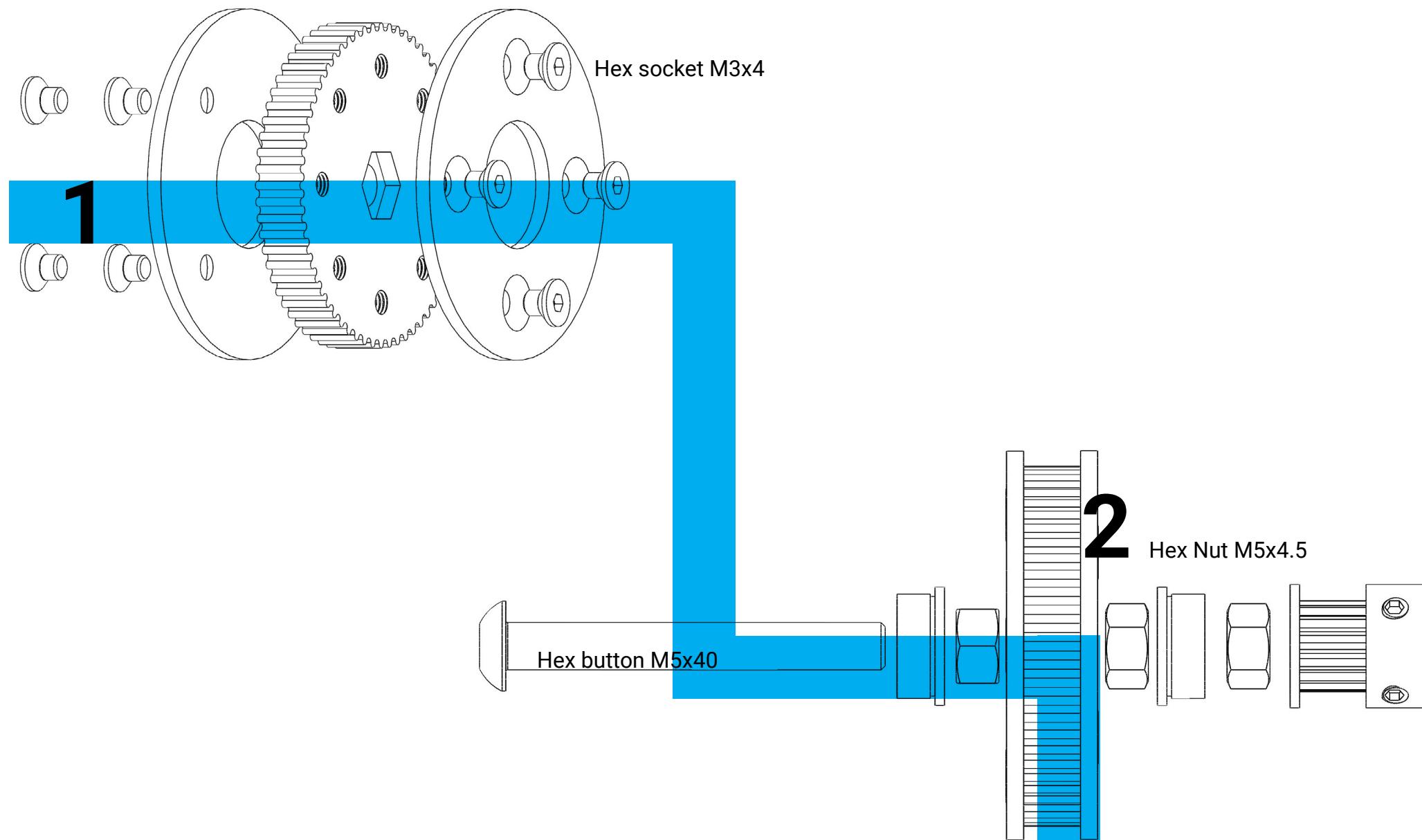
Kit List

4	Hex Socket Bolt, Button	M3*12	2	Square Bolt	M3*2.3
3	Hex Socket Bolt, Button	M3*8	6	Washer	M5*8.4*1
1	Hex Socket Bolt, Button	M3*4	3	Washer	M3*7*.65
3	Hex Socket Bolt, Button	M5*50	3	Washer	M5*10*1
2	Hex Socket Bolt, Button	M5*40	2	Stepped Bearing	M5*12.5*5
1	Hex Socket Bolt, Button	M5*30	1	Notched Bearing	M3*12*4
8	Hex Socket Bolt, Countersunk	M3*6	6	Hex Nut	M5*4.5
2	Extruder Structural Plate	85*58*4.7	2	Hex Nut	M5*3
1	Extruder Nozzle Holder	38*21*6	1	Spring	6*11
1	Extruder Belt Holder	57*17*2.75	1	Extruder Heatsink	43*22.5
1	Spring Holder	13*8*6	1	Threaded Heatsink Connector	7*22.25
1	Filament Holder Lever	61*39*6	1	Threaded Filament Guide	44*10
4	Acrylic Spacer	M5*10*3	1	Heat Transfer Block	11.5*20.5*20.5
8	Acrylic Spacer	M5*10*6	1	Nozzle	21*7
1	60 Tooth Acrylic Gear	M5*38*6	1	Timing Pulley 16 Tooth	13*14
2	Belt Guides	41*1.8	1	Toothed Filament Wheel	M5*11*11
4	Xtreme Solid V Wheel	M5*23.9*11	1	PrimoPal Stepper Motor	35*35*58
1	Filament Belt		1	Heating Wire	
2	Eccentric Spacer M5 Hex*6		1	Thermostat Wire	
2	Aluminium Spacer	M5*10*6	1	Extruder Movement Belt	



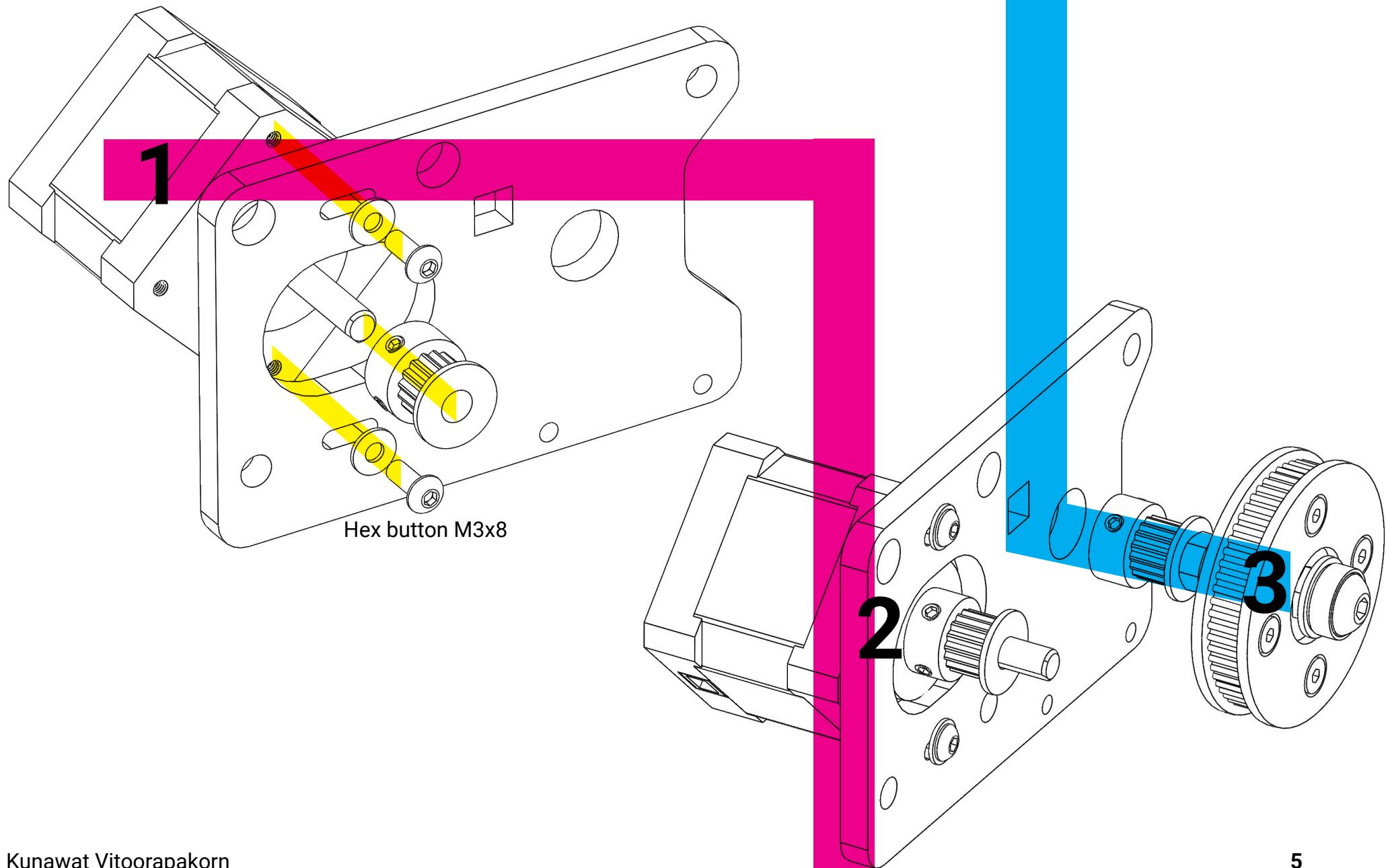
Extruder

Part 1: Wheelie



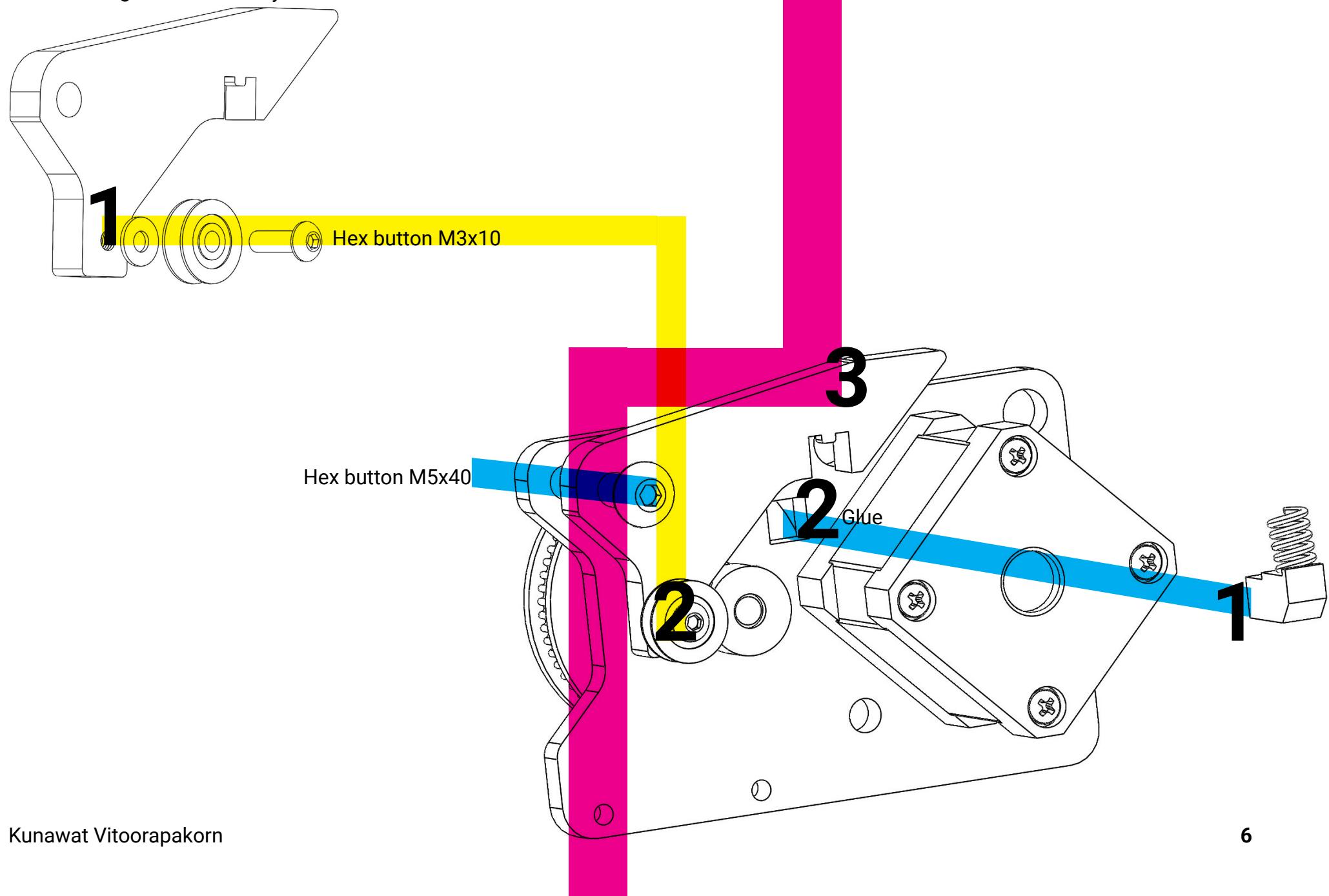
Extruder

Part 2: Engine Assembly



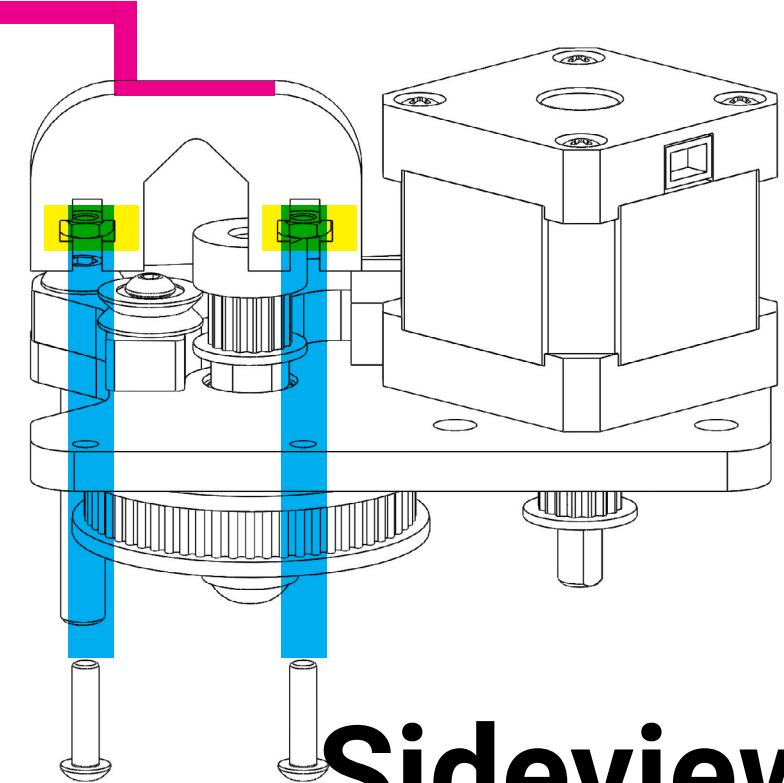
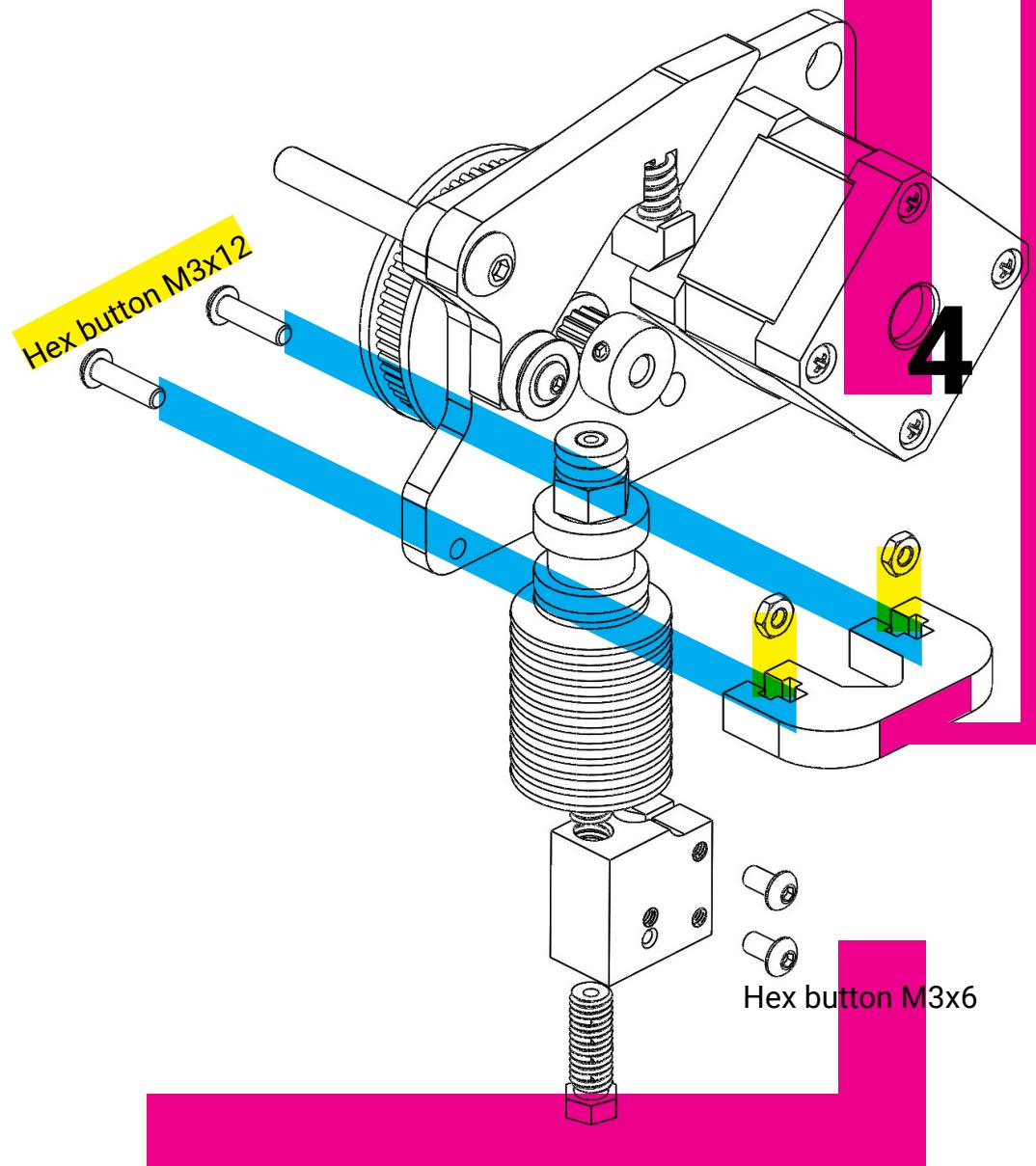
Extruder

Part 3: Triangle and Assembly



Extruder

Part 4: Nozzle and Assembly

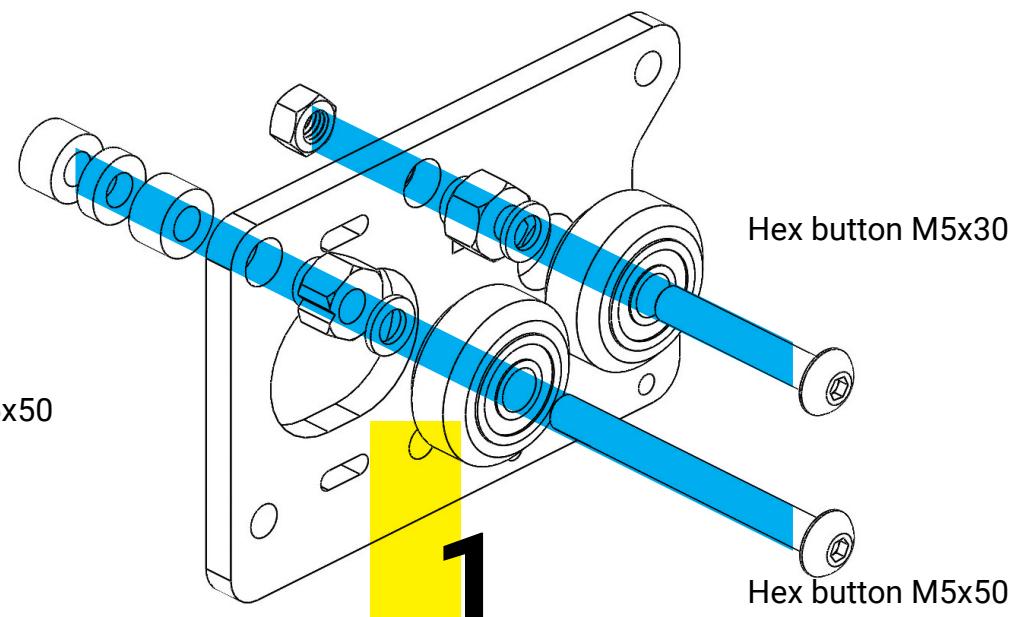
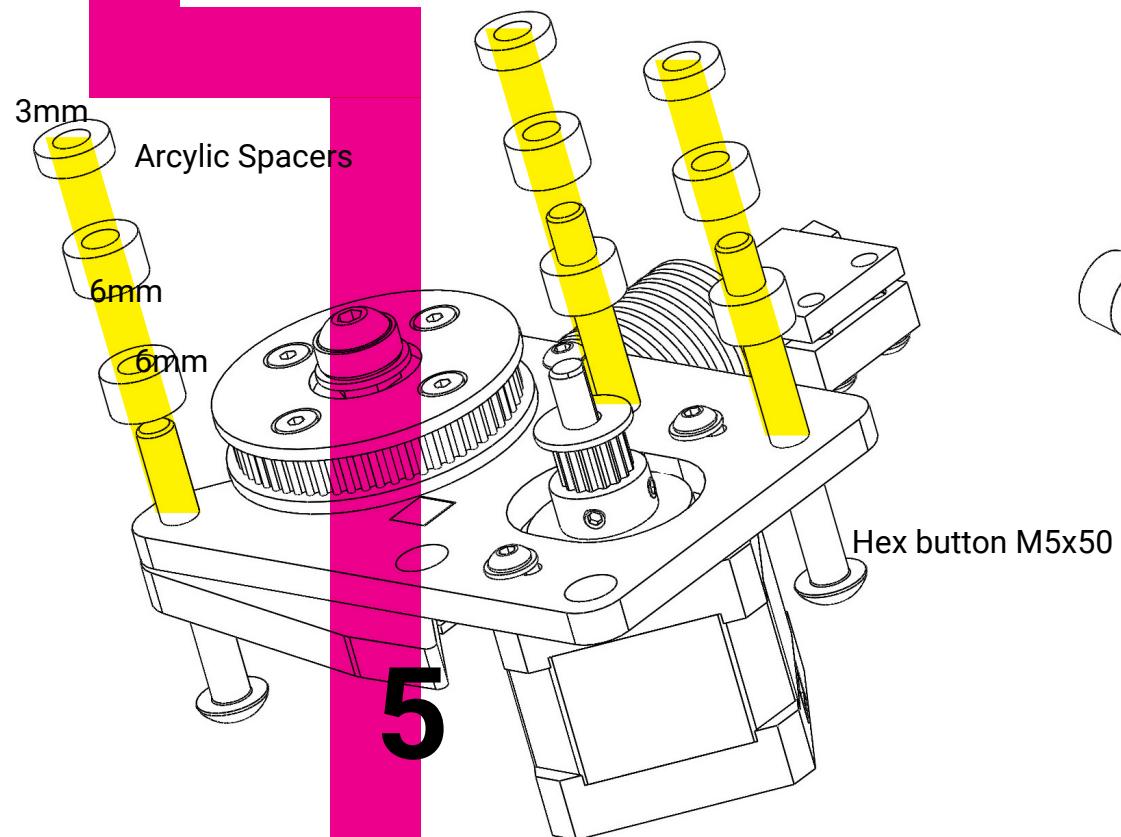


Sideview

Hex button M3x12

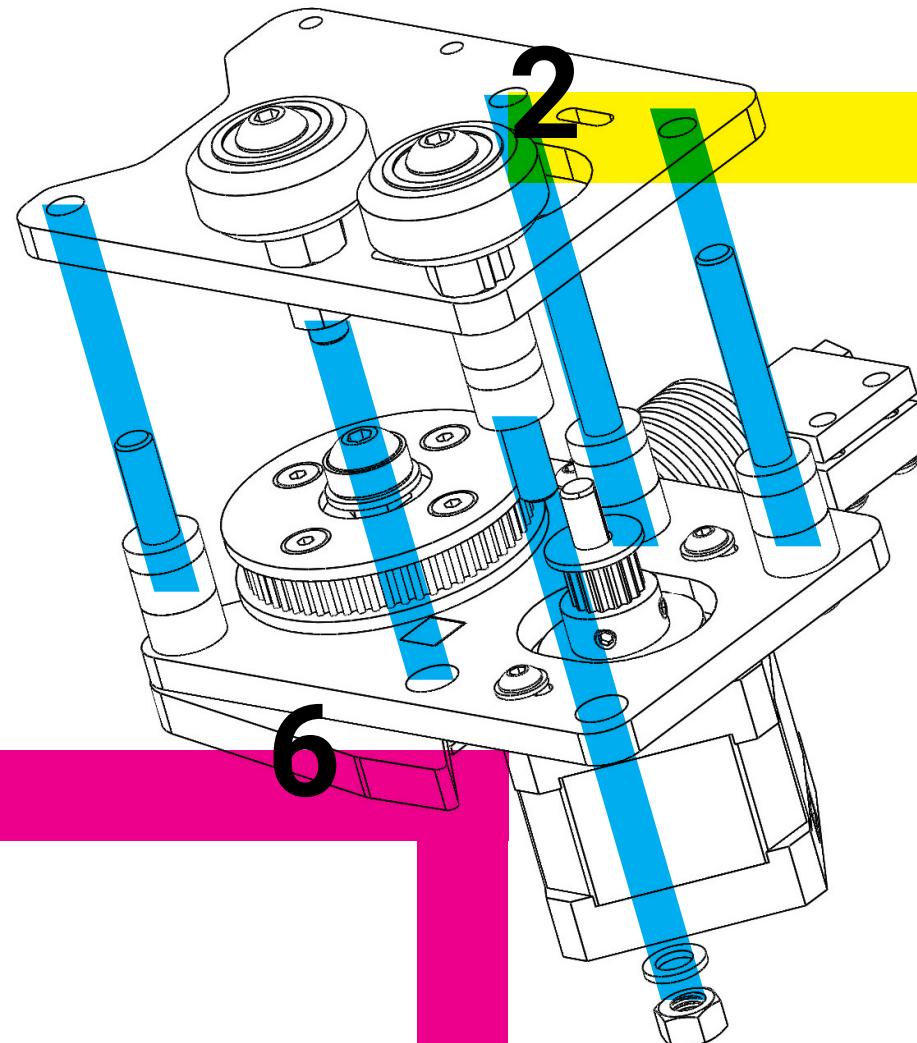
Extruder

Part 5: Wheel and Spacers



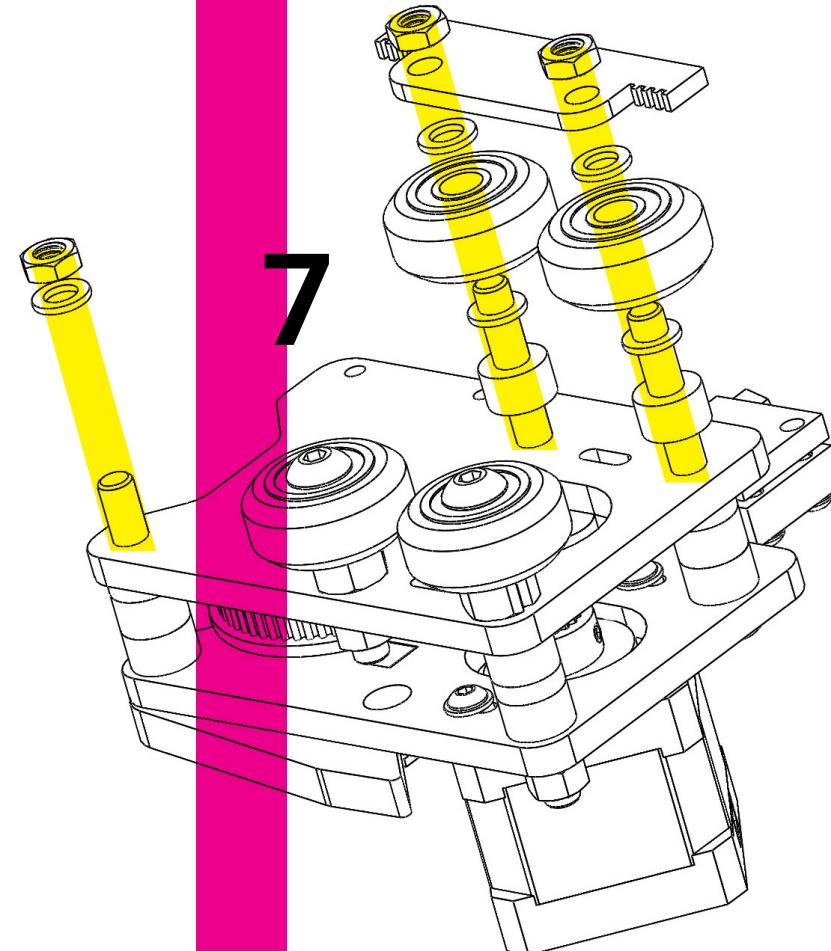
Extruder

Part 6: Assemble



Extruder

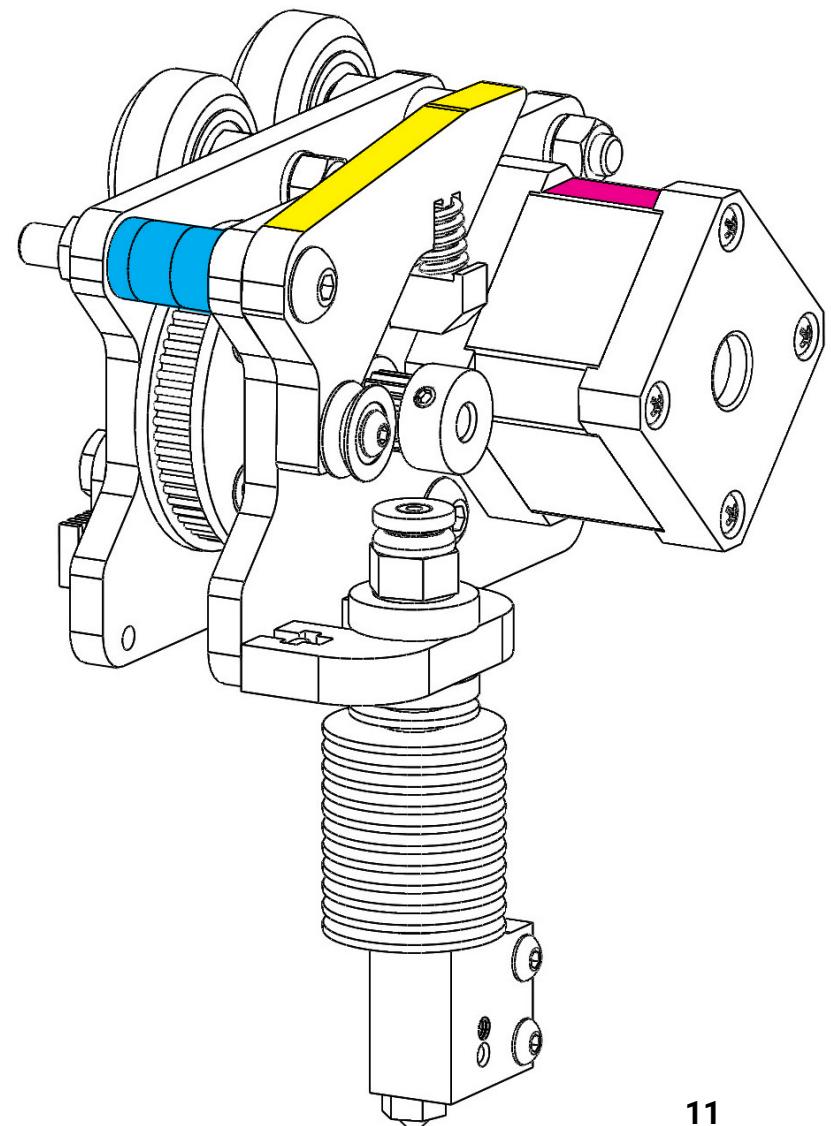
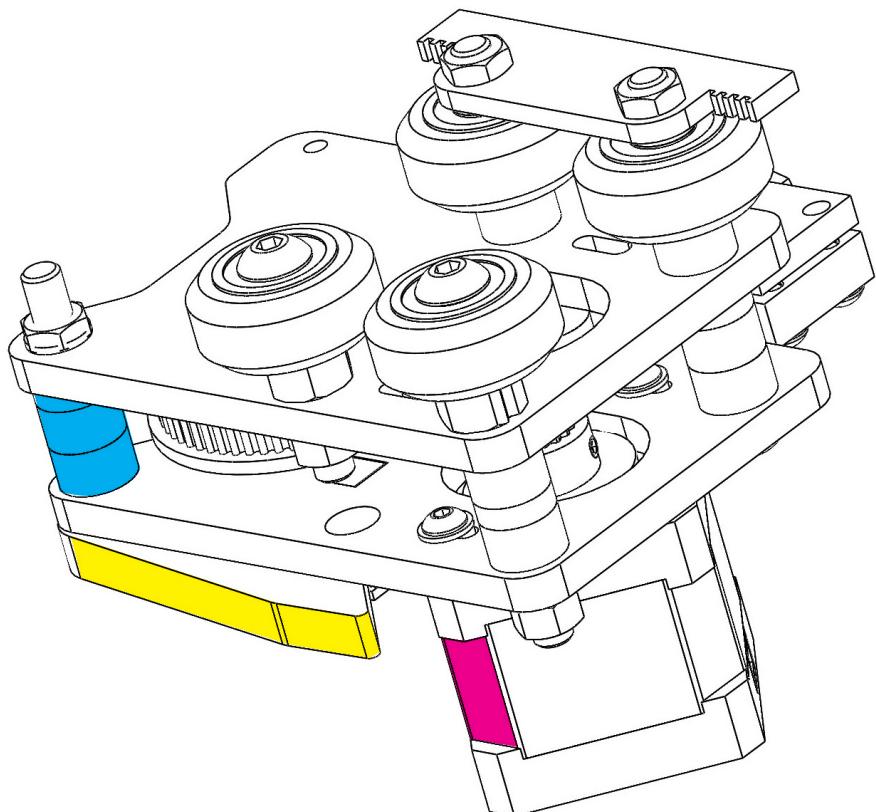
Part 7: Final Assembly



Extruder

Extruder Complete: Double Check

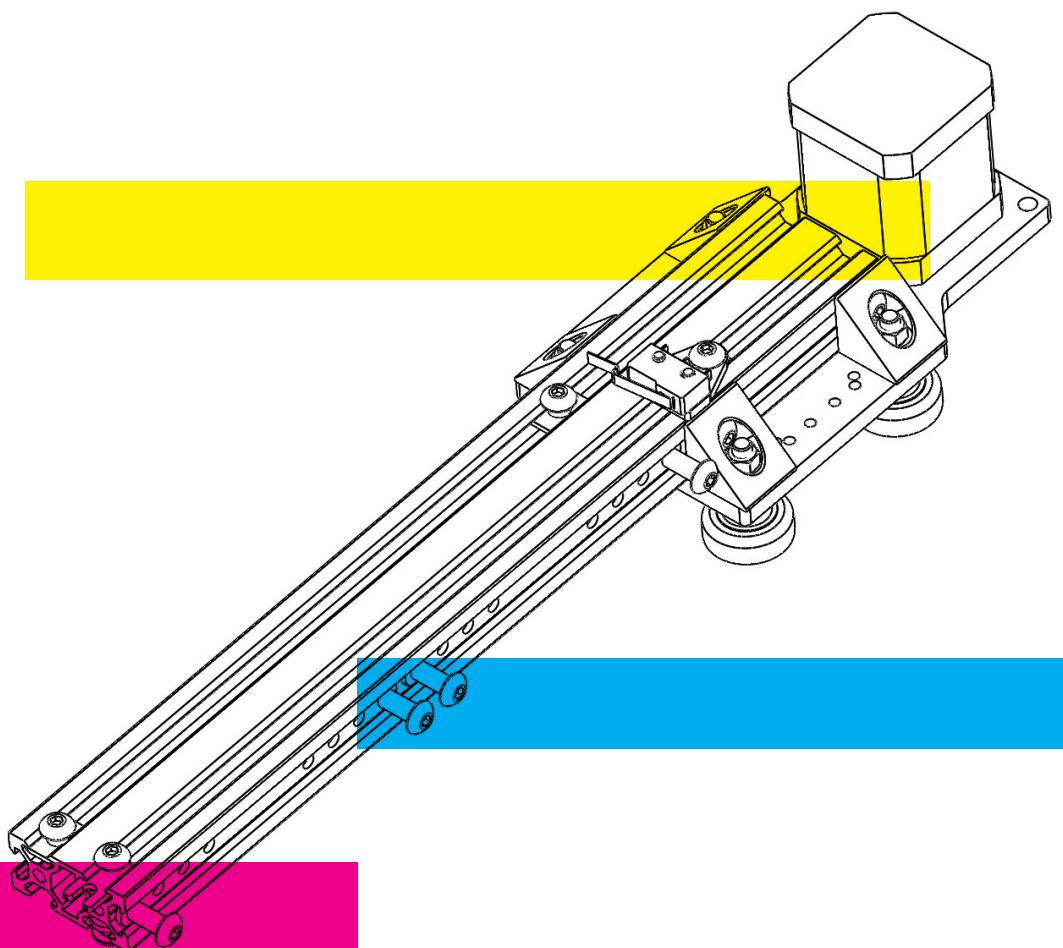
Complete



Part 2: Z-Axis

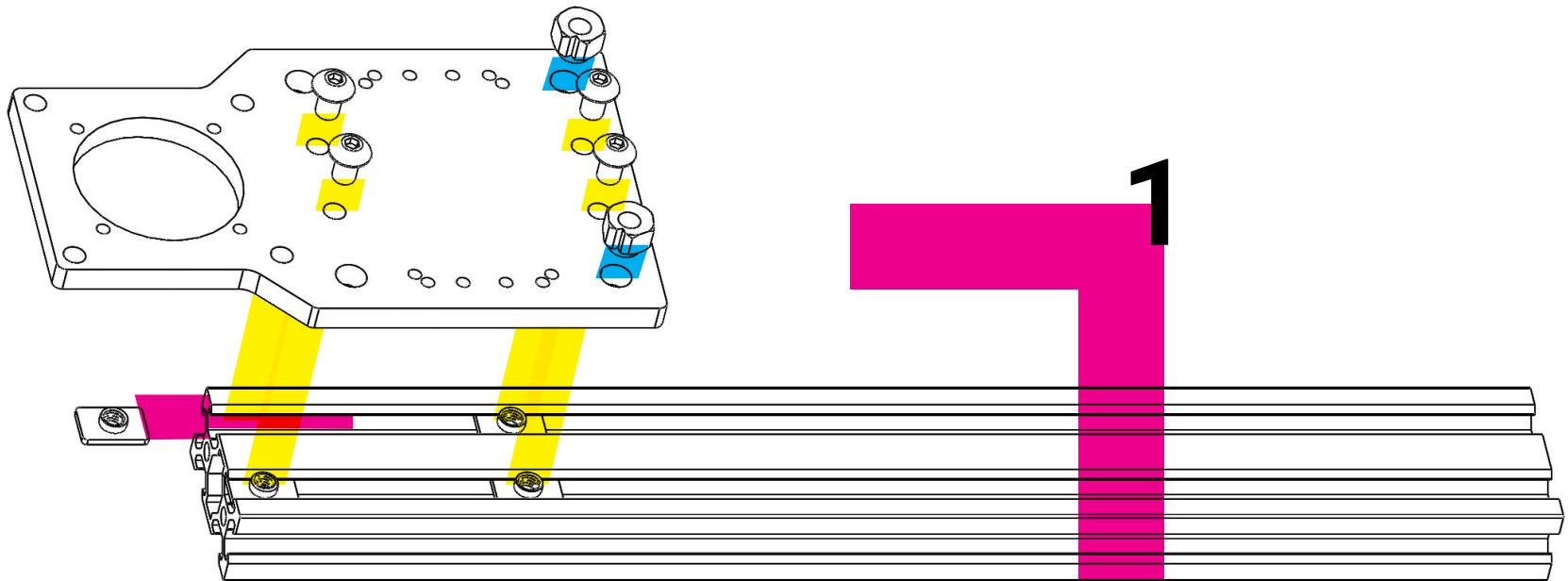
Kit List

4	Hex Socket Bolt, Button	M5*35
4	Hex Socket Bolt, Button	M5*16
13	Hex Socket Bolt, Button	M5*8
6	Hex Socket Bolt, Button	M3*10
2	Hex Socket Bolt, Countersunk	M3*10
1	Z Axis Structural Plate	136*79.8*6
4	Angle Corner Connector	20*20*20
4	Hex Nut M5*4.5	
3	Threaded Popsicle	109.5*9.65*1.8
1	Short Threaded Popsicle	19.75*9.65*1.8
2	Micro Limit Switch	N/A
1	Limit Switch Holder, Countersunk	24.5*19.5*3
4	Xtreme Solid V Wheel	M5*23.9*11
1	OSM Stepper Motor Small	42*42*62.5
1	Timing Pulley 16 Tooth	13*14
4	Washer M5*8.4*1	
4	Linear Rail Bracket, Small	10*6*4.25
7	Linear Rail Bracket, Large	15*10*3.5
2	Aluminium Spacer	M5*10*6
1	V-Slot Linear Rail	300*20*40
2	Eccentric Spacer M5 Hex	*6
1	Z Axis Movement Belt	



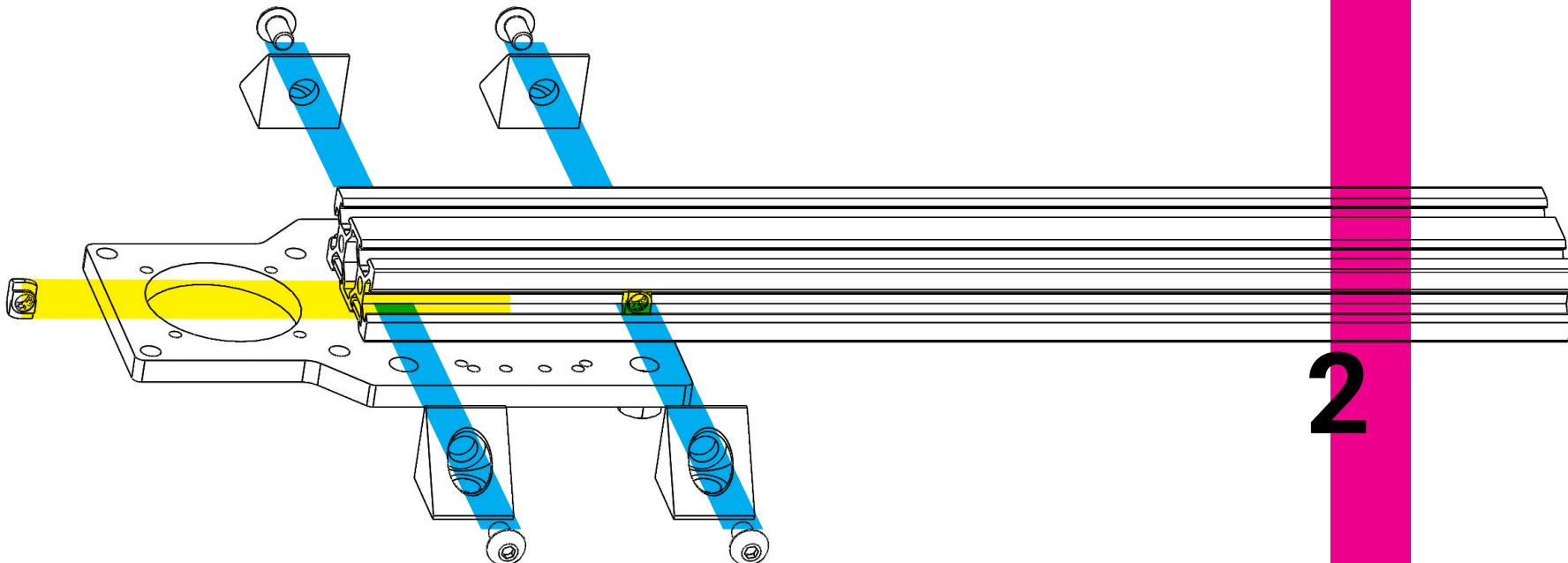
Z-Axis

Attach Plating



Z-Axis

Attach Triganle

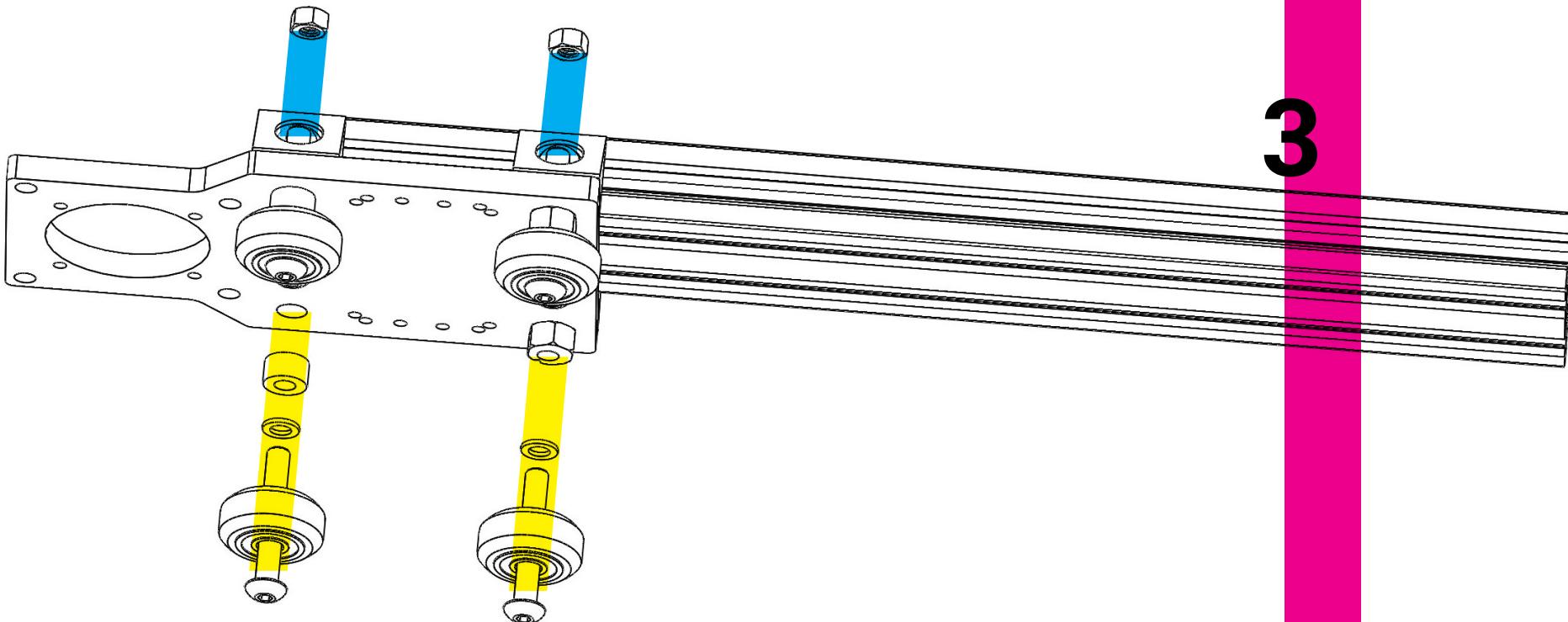


2

Z-Axis

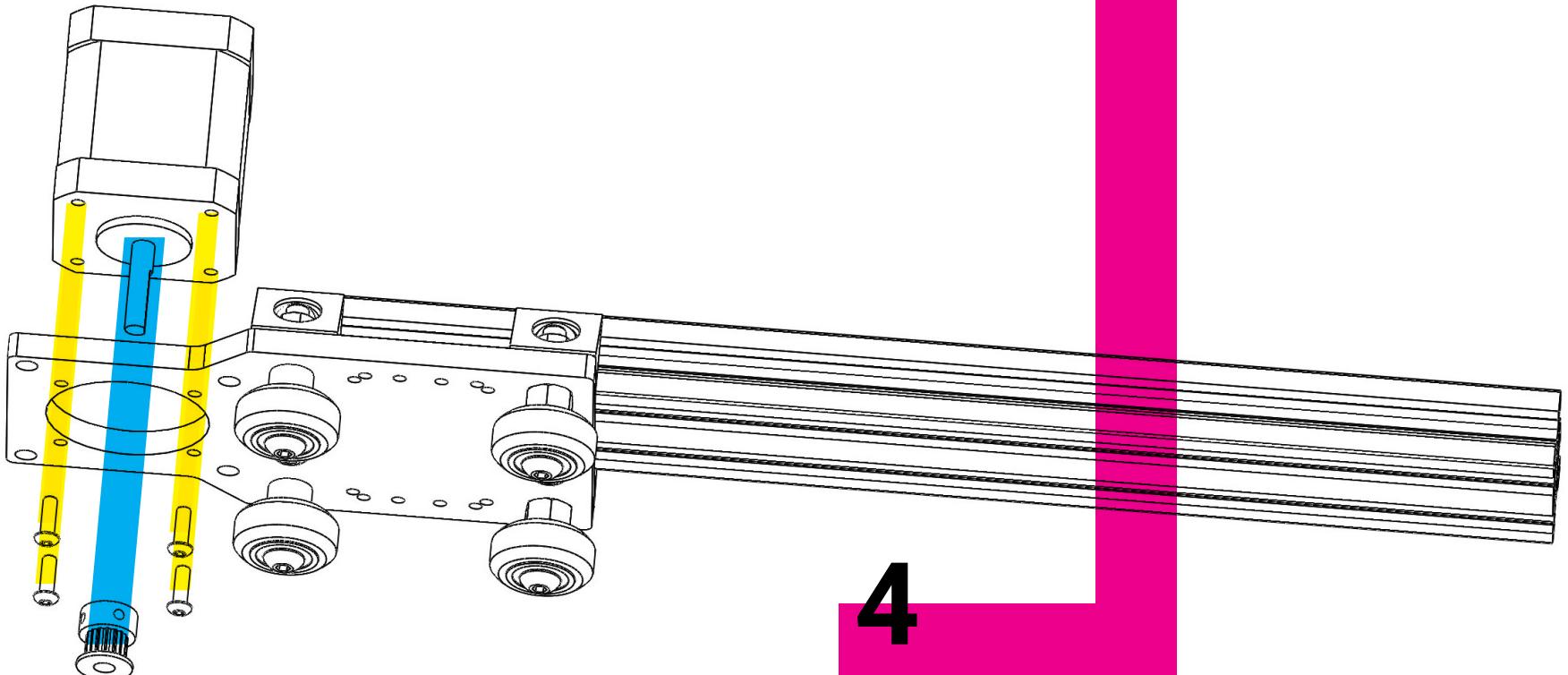
Attach Wheel

3



Z-Axis

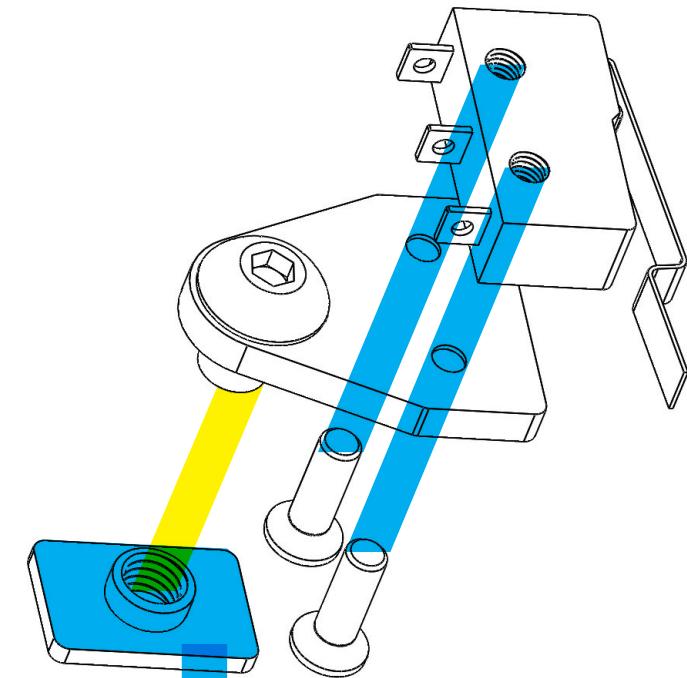
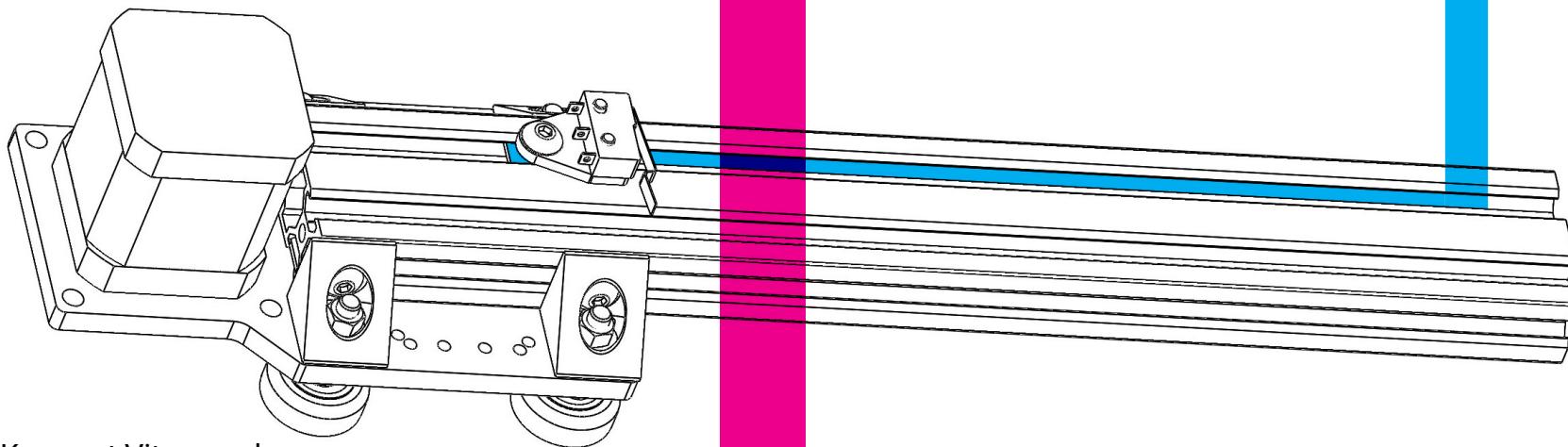
Attach Motor



Z-Axis

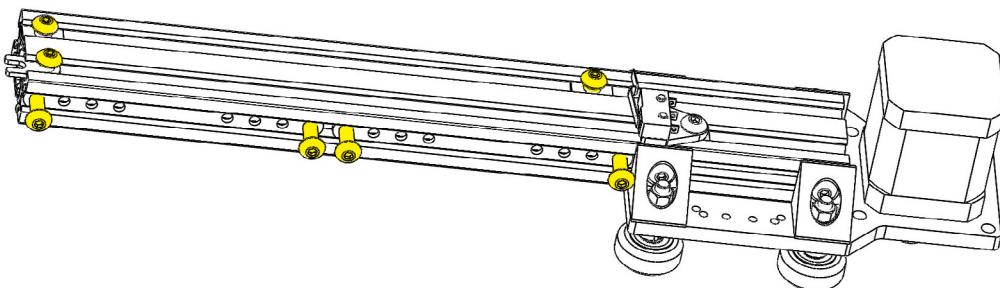
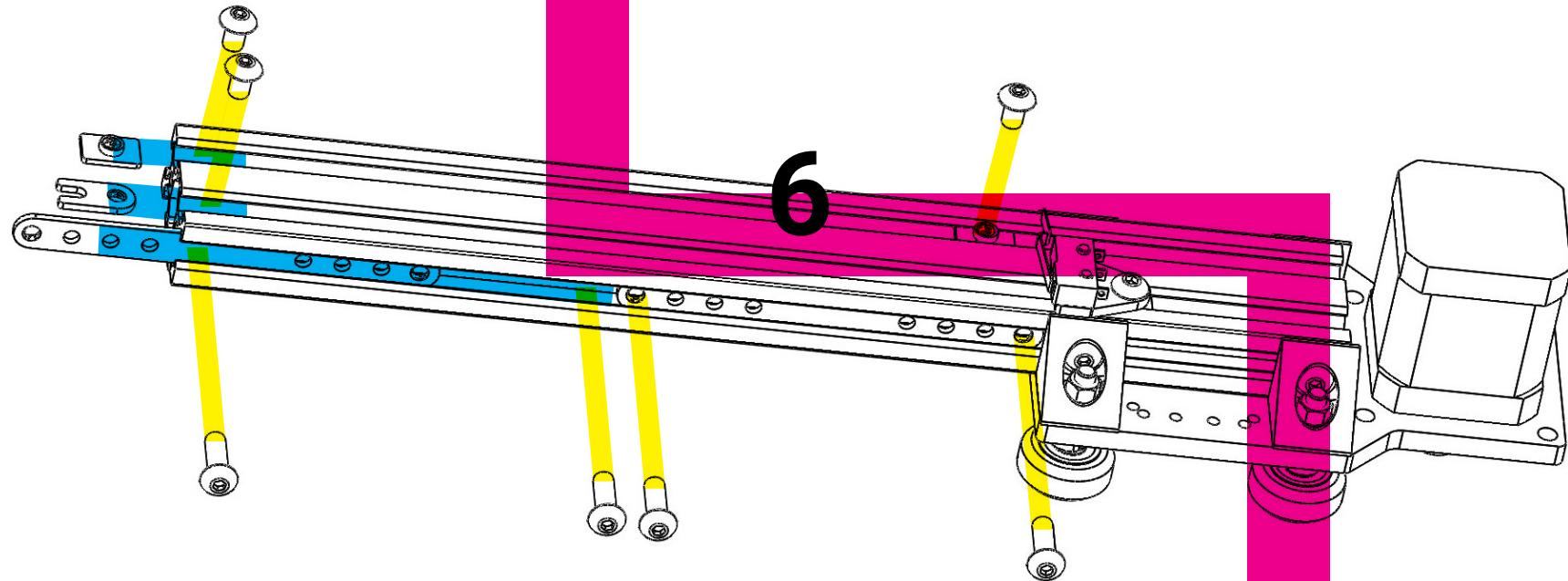
Limiter

5



Z-Axis

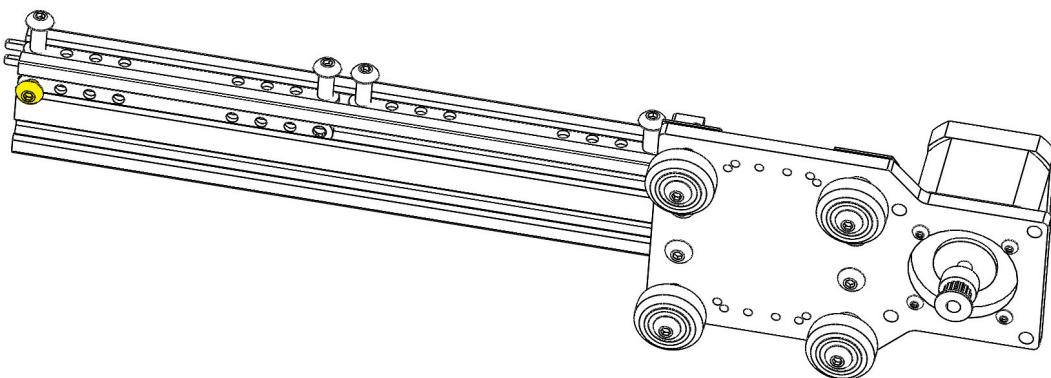
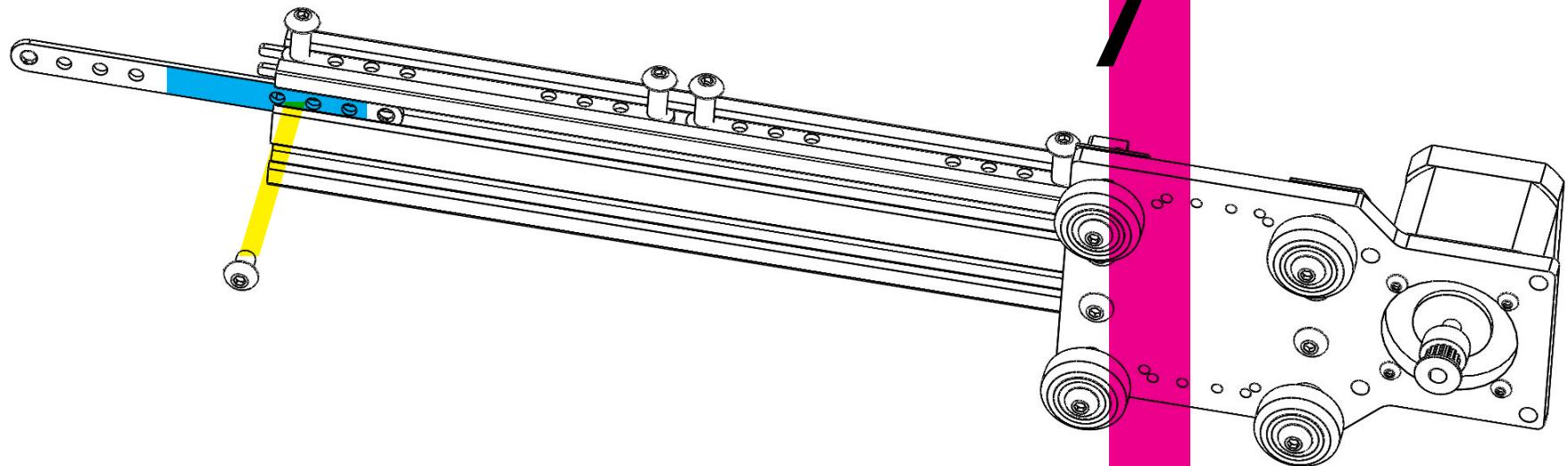
Screws



Z-Axis

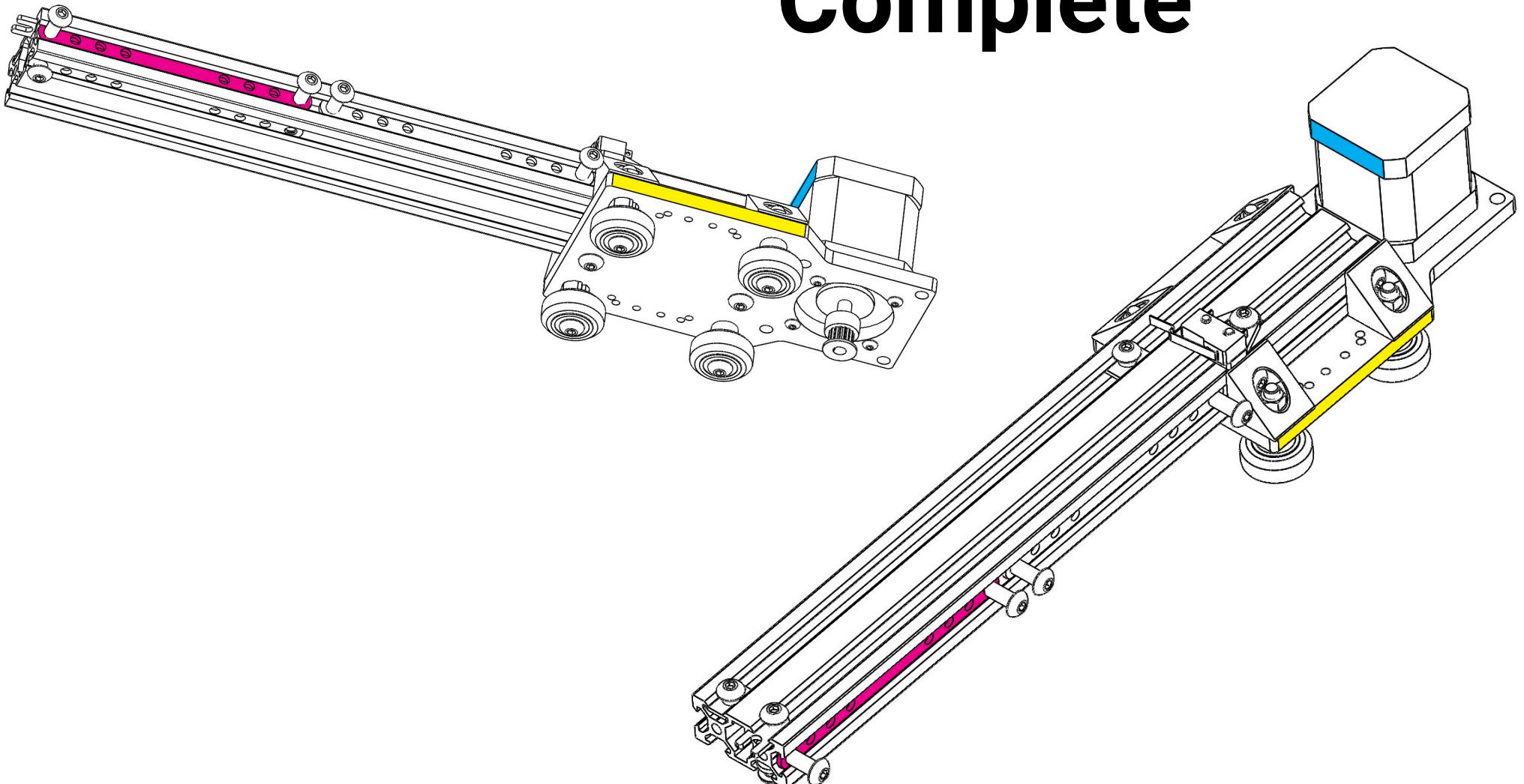
More Screws

7



Z-Axis

Complete

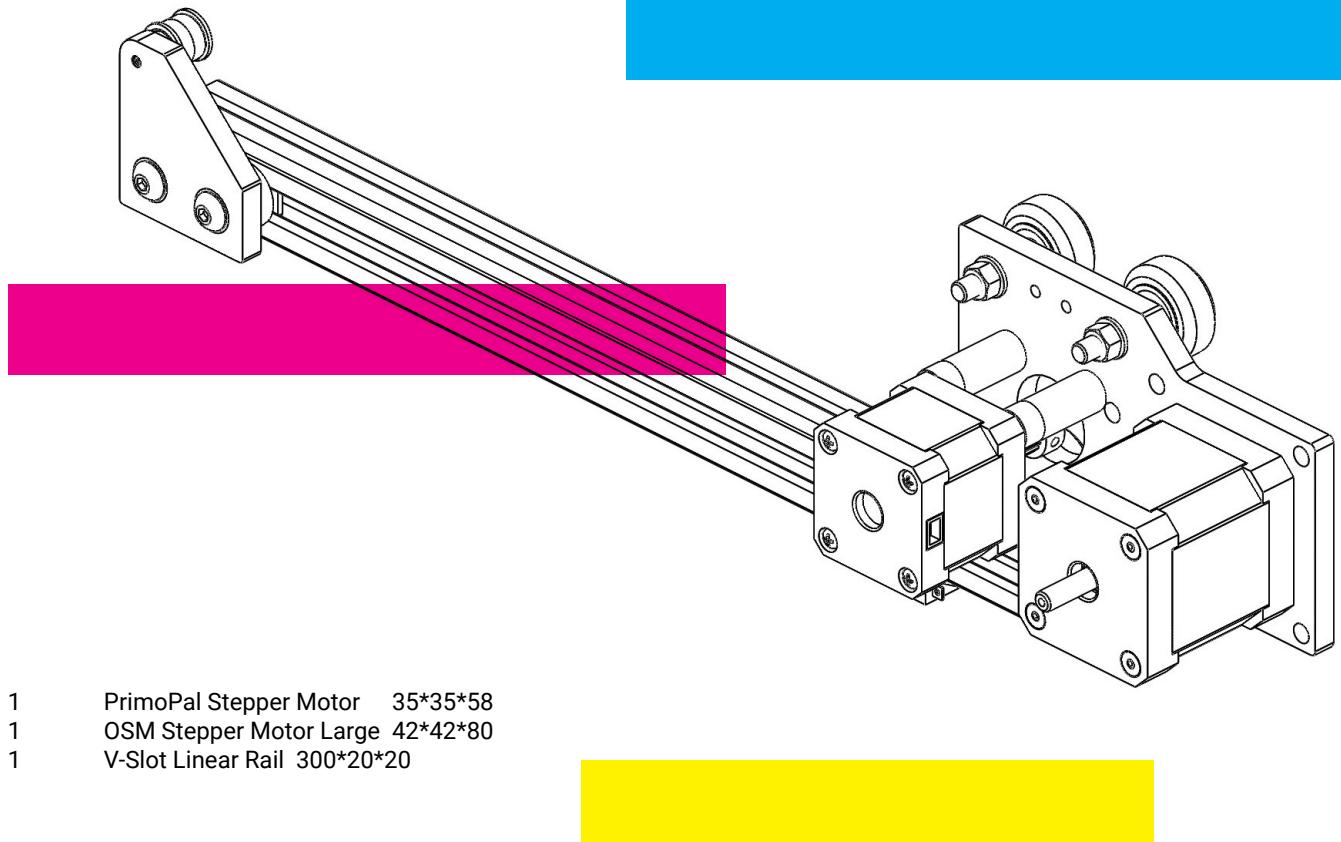


Complete

Part 3: Y-Axis

Kit List

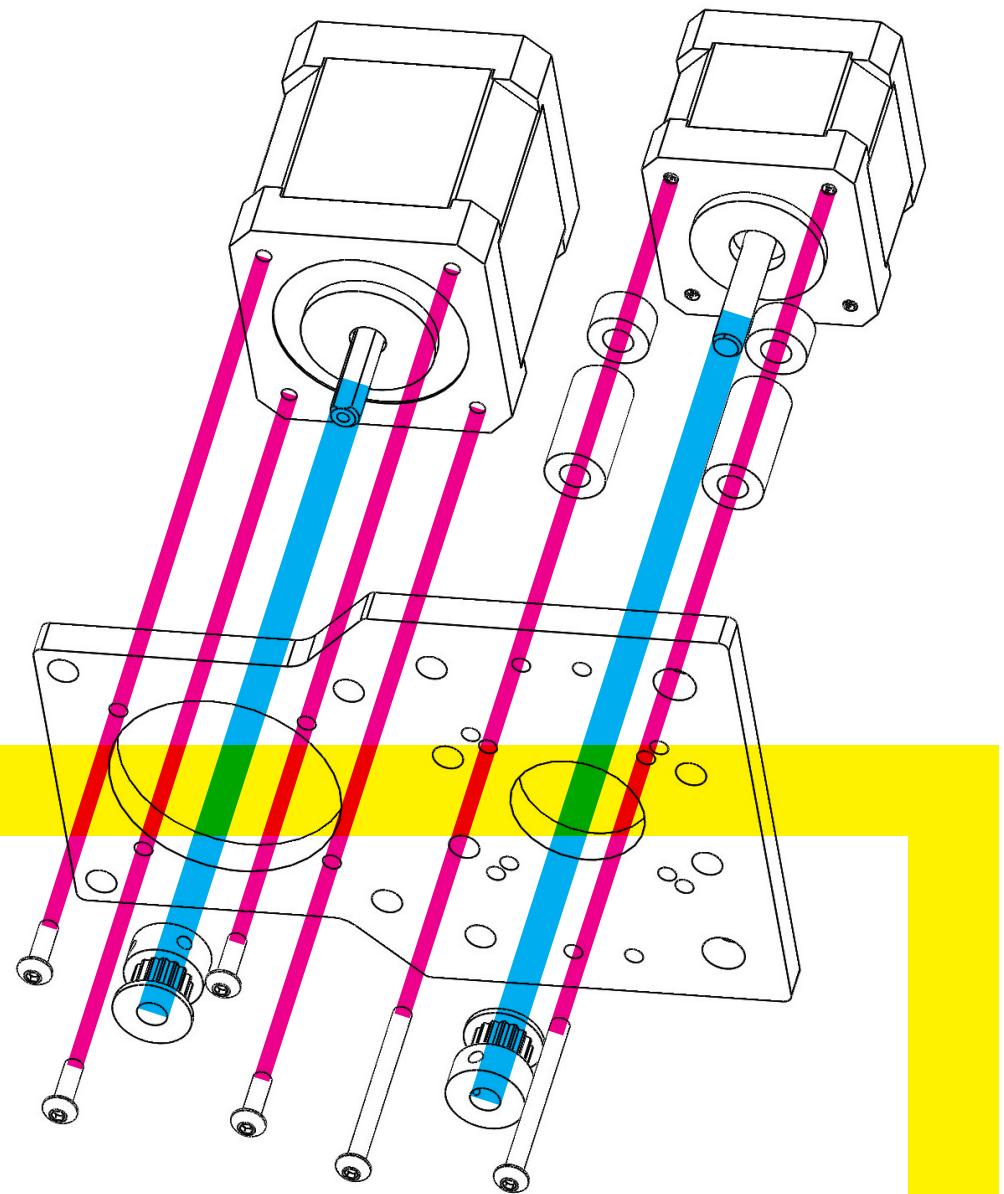
1	Hex Socket Bolt, Button	M3*16
4	Hex Socket Bolt, Button	M3*10
2	Hex Socket Bolt, Button	M5*8
2	Hex Socket Bolt, Button	M5*16
2	Hex Socket Bolt, Button	M5*30
2	Hex Socket Bolt, Button	M5*35
2	Hex Socket Bolt, Countersunk	M3*10
2	Hex Socket Bolt, Countersunk	M3*35
1	Y Axis Structural Plate	116*80*6
1	Tensioning Bearing Holder	40*45*6
2	Stepped Bearing	M5*12.5*5
4	Xtreme Solid V Wheel	M5*23.9*11
1	Acrylic Spacer	M3*9*3
2	Acrylic Spacer	M5*16*6
2	Acrylic Spacer	M5*10*6
1	Washer	M3*7*.65
4	Washer	M5*8.4*1
2	Washer	M5*10*1
6	Linear Rail Bracket, Large	15*10*3.5
2	Eccentric Spacer	M5 Hex*6
2	Aluminium Spacer	M5*10*6
2	Aluminium Spacer	M5*10*20
1	Limit Switch Holder, Countersunk	24.5*19.5*3
1	Limit Switch Holder	24.5*19.5*3
1	Micro Limit Switch, Short Arm	N/A
2	Timing Pulley 16 Tooth	13*14
2	Hex Nut	M5*4.5



Y-Axis

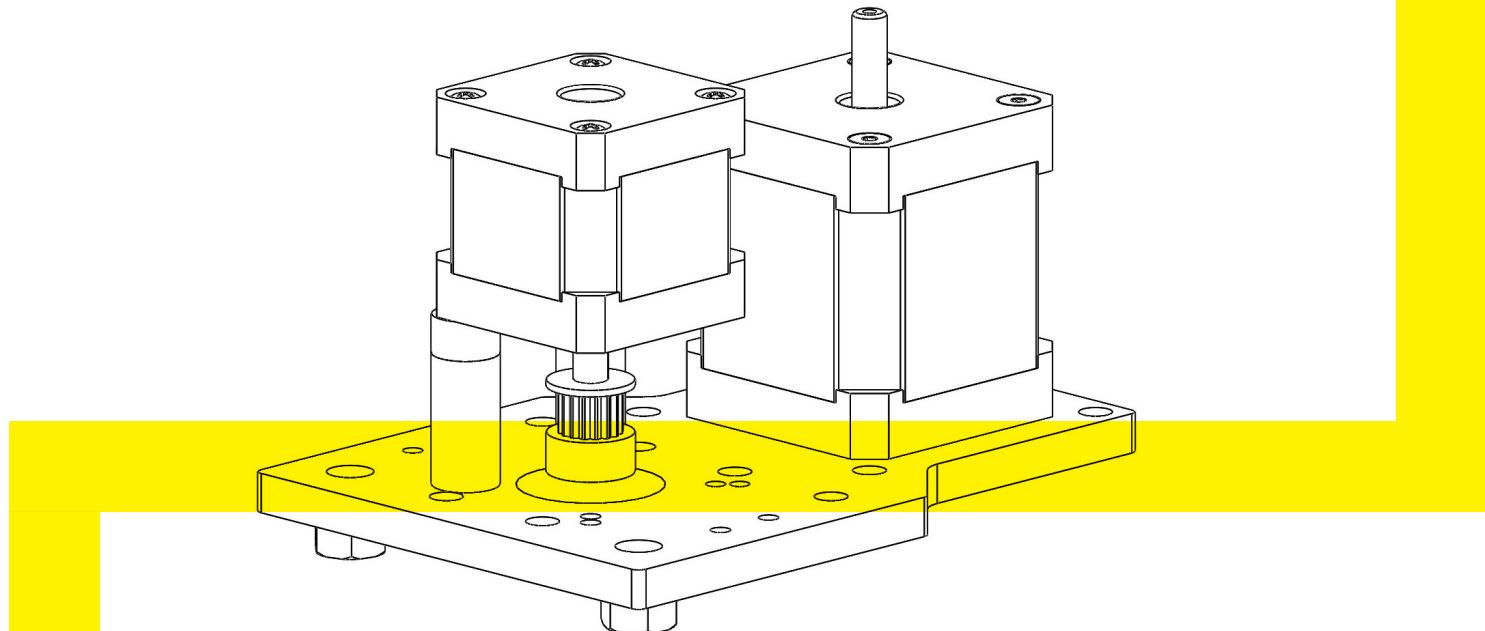
Attach Motors

1



Y-Axis

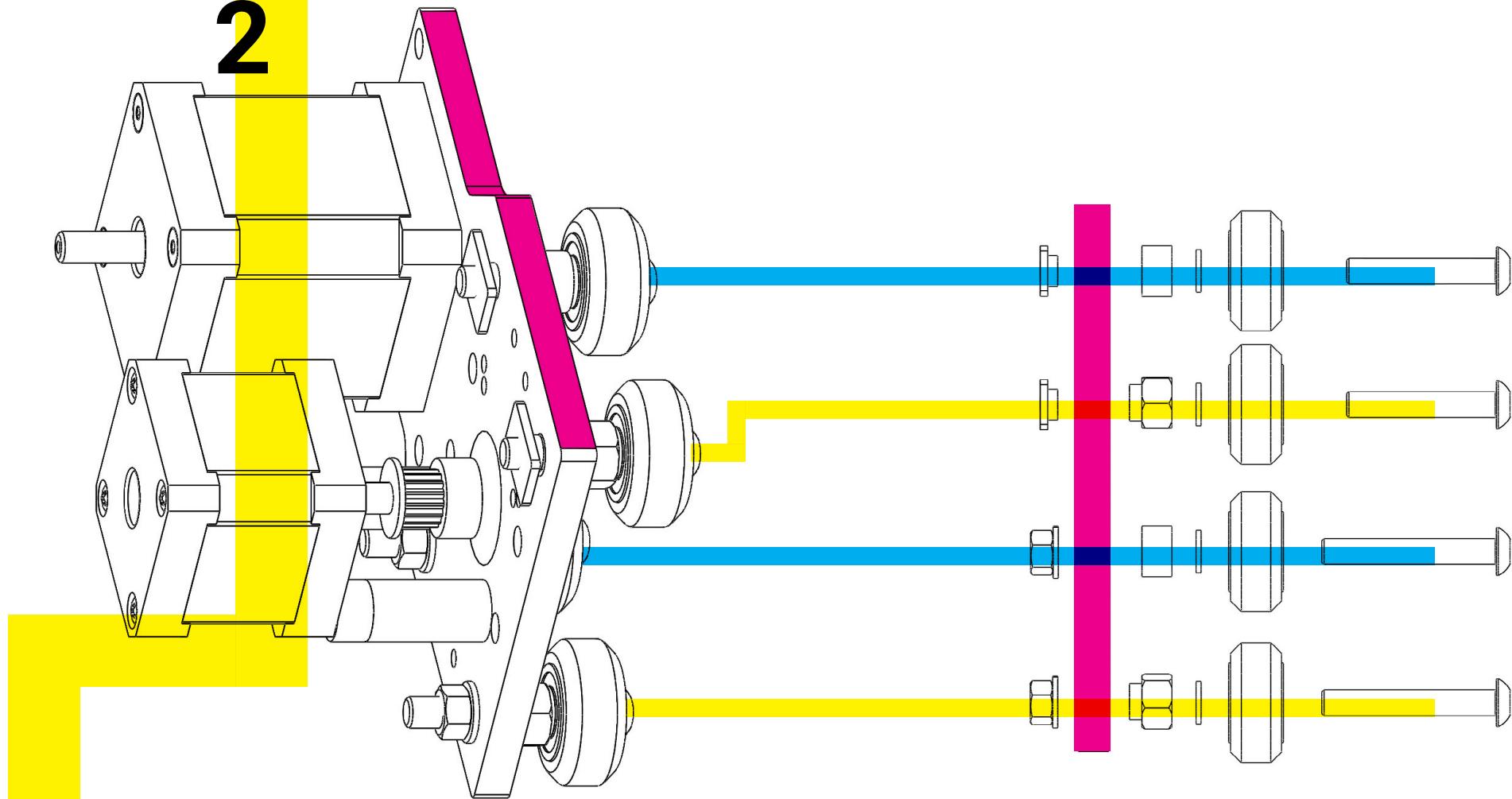
Attached Motors



Y-Axis

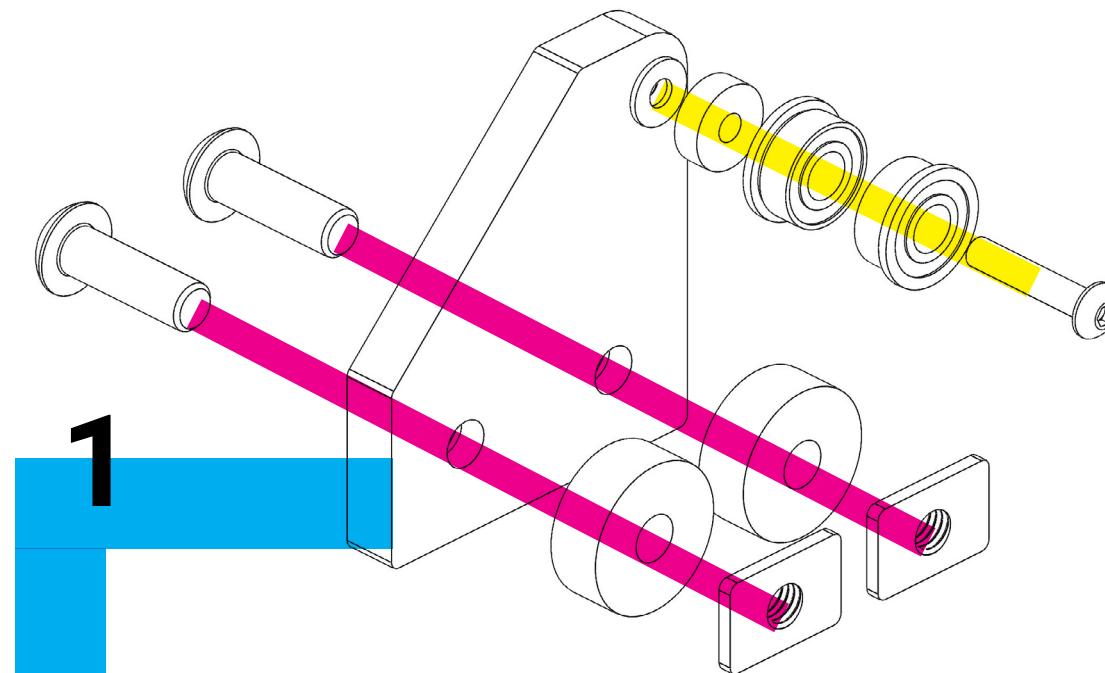
Insert Wheels

2



Y-Axis

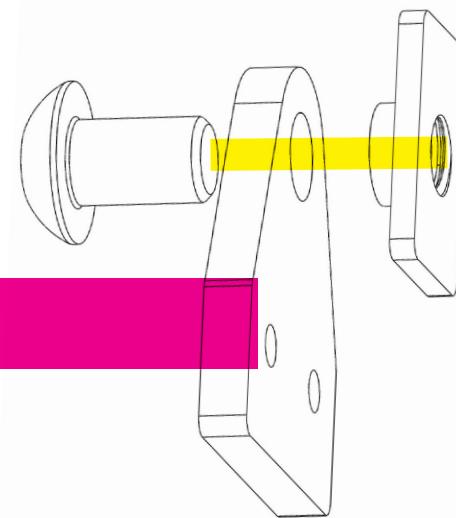
Tension Wheel



Y-Axis

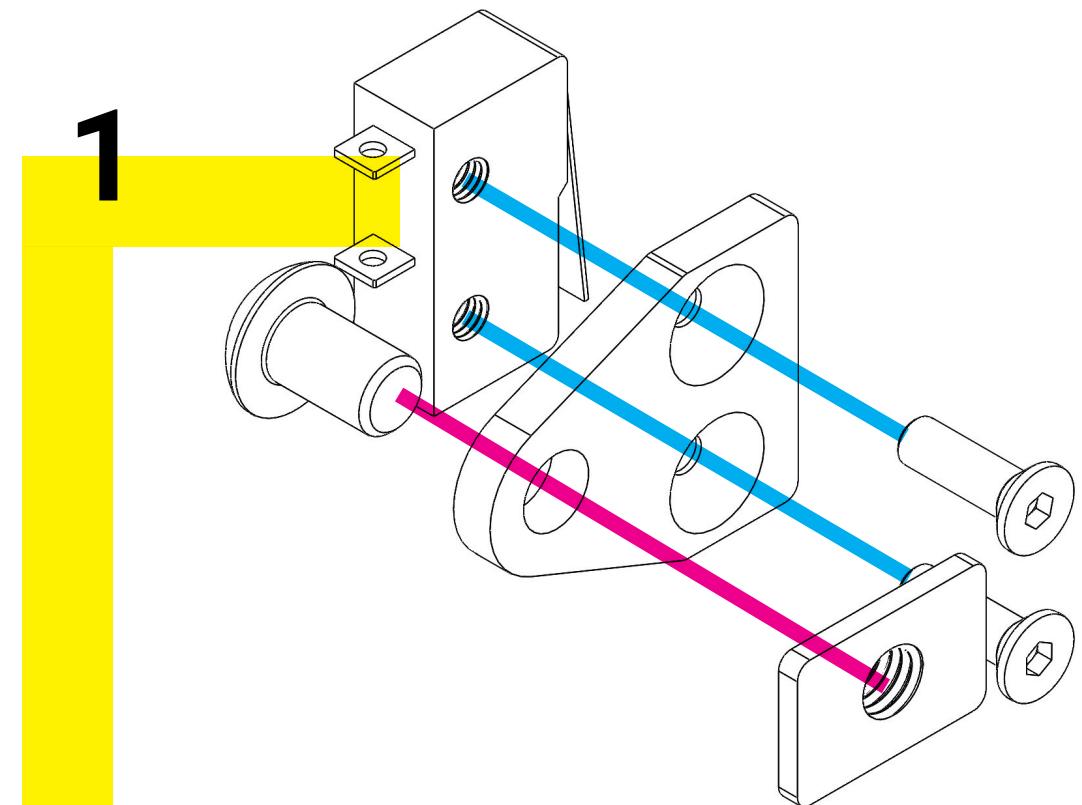
Cable Management

1



Y-Axis

Limiter



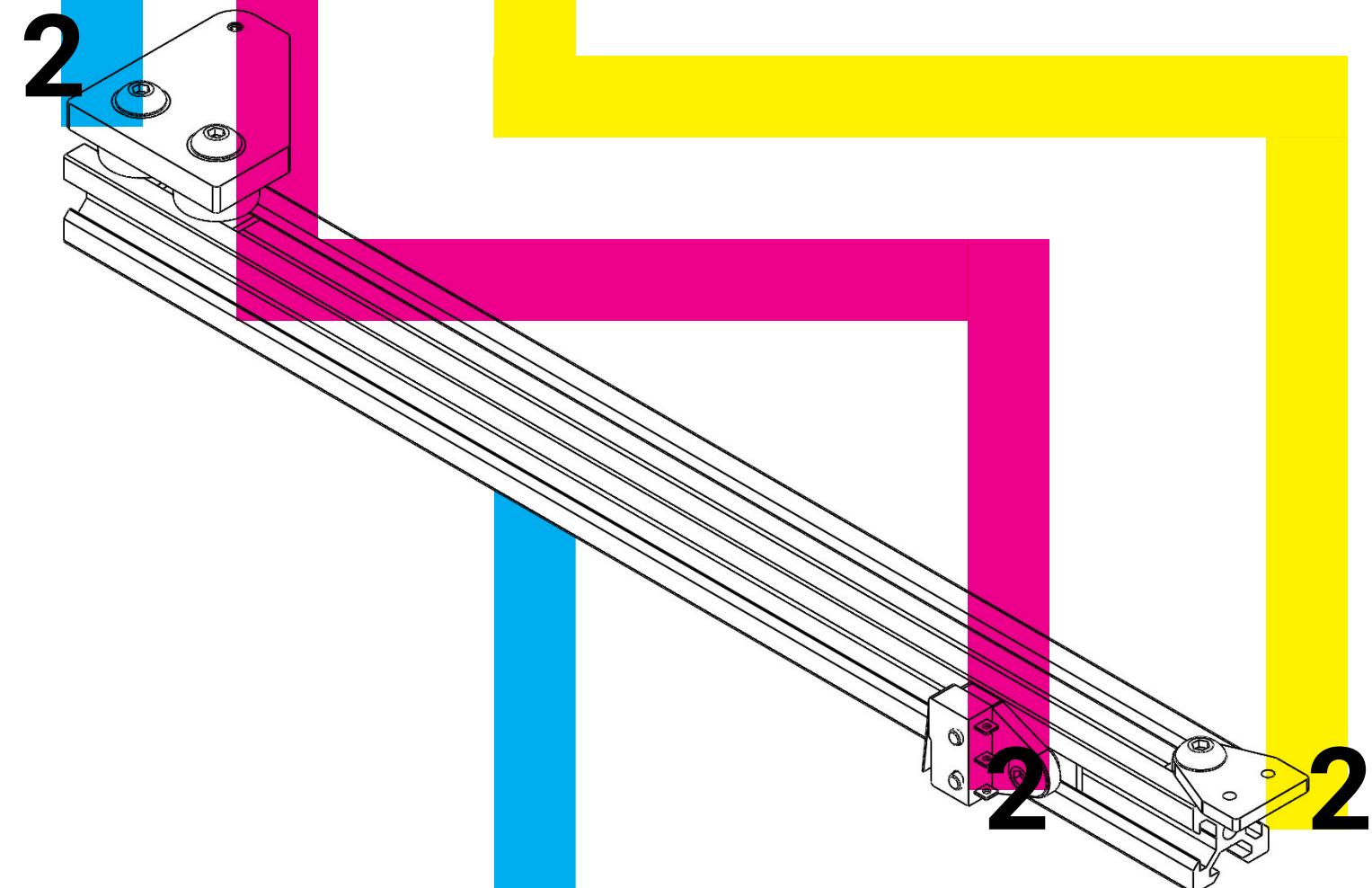
Y-Axis

Take a break

**Y-AKIS
ALMOST THERE**

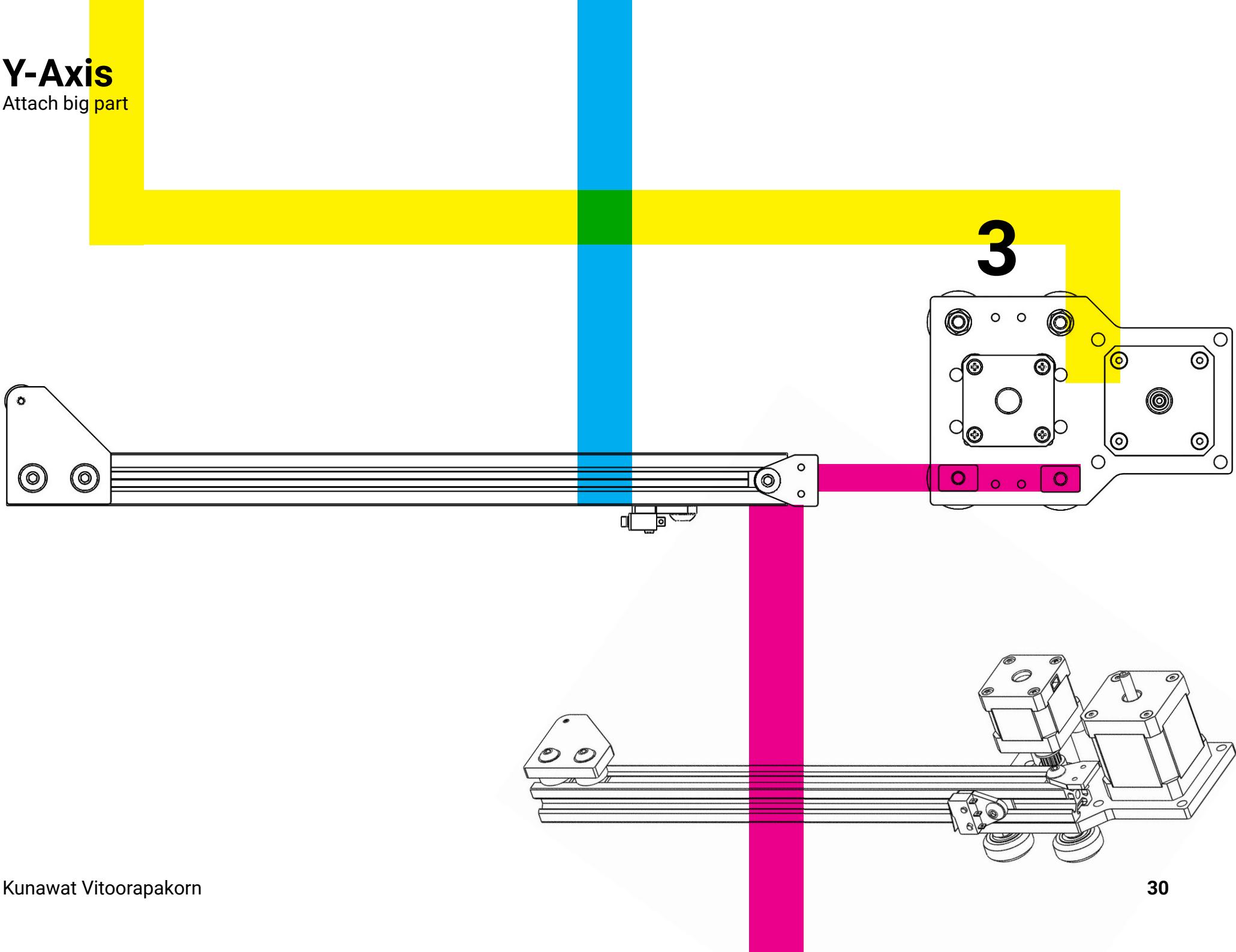
Y-Axis

Assemble the small parts



Y-Axis

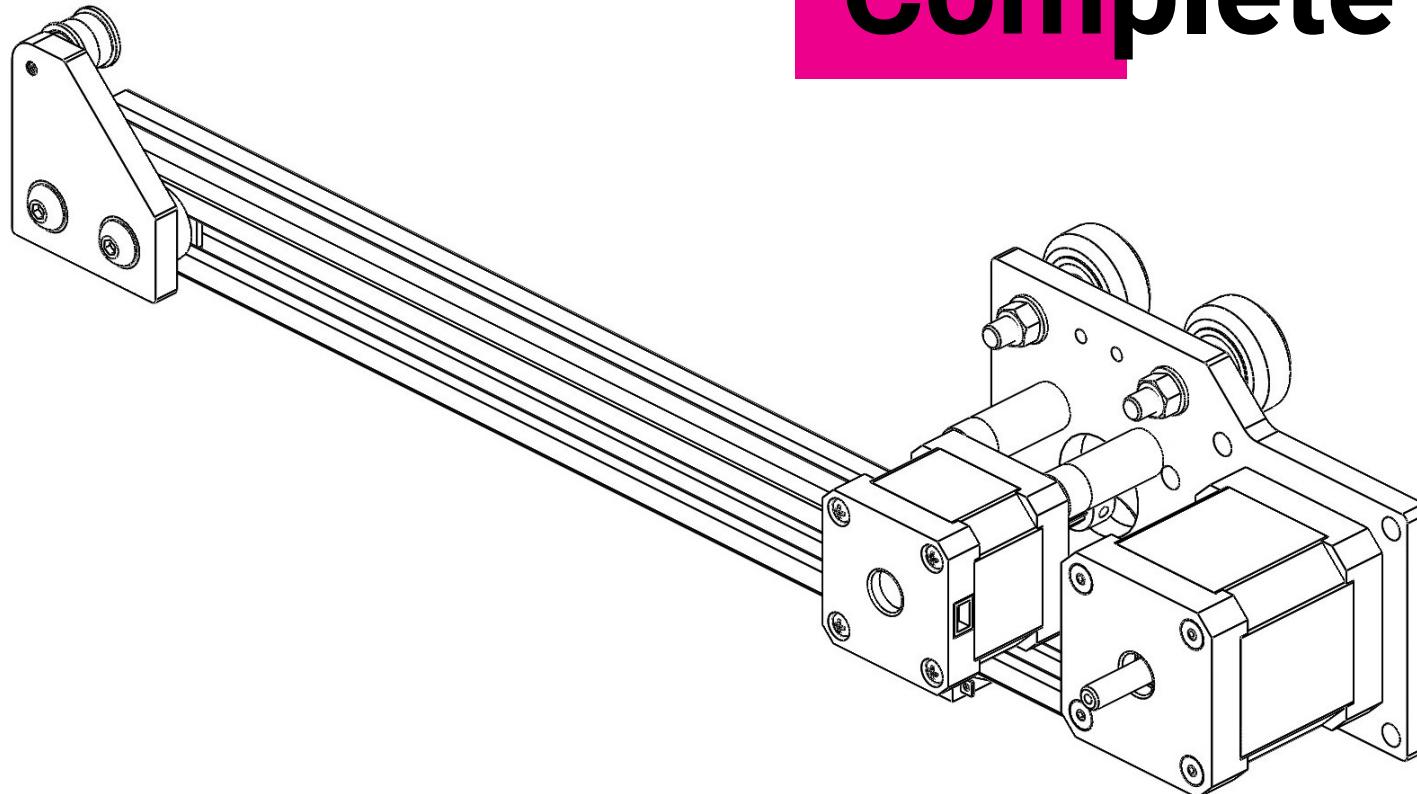
Attach big part



Y-Axis

Complete

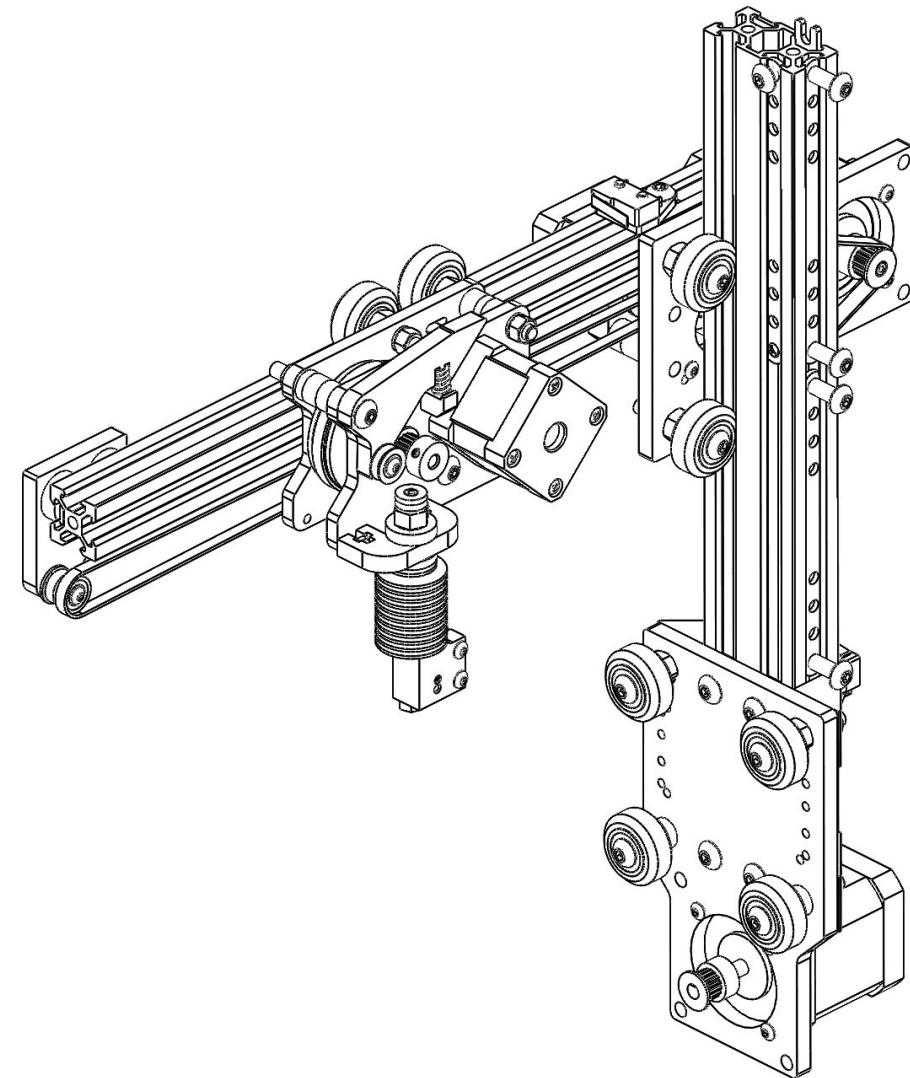
Complete



Assembly

Kit List

Extruder
Z Axis
Y Axis

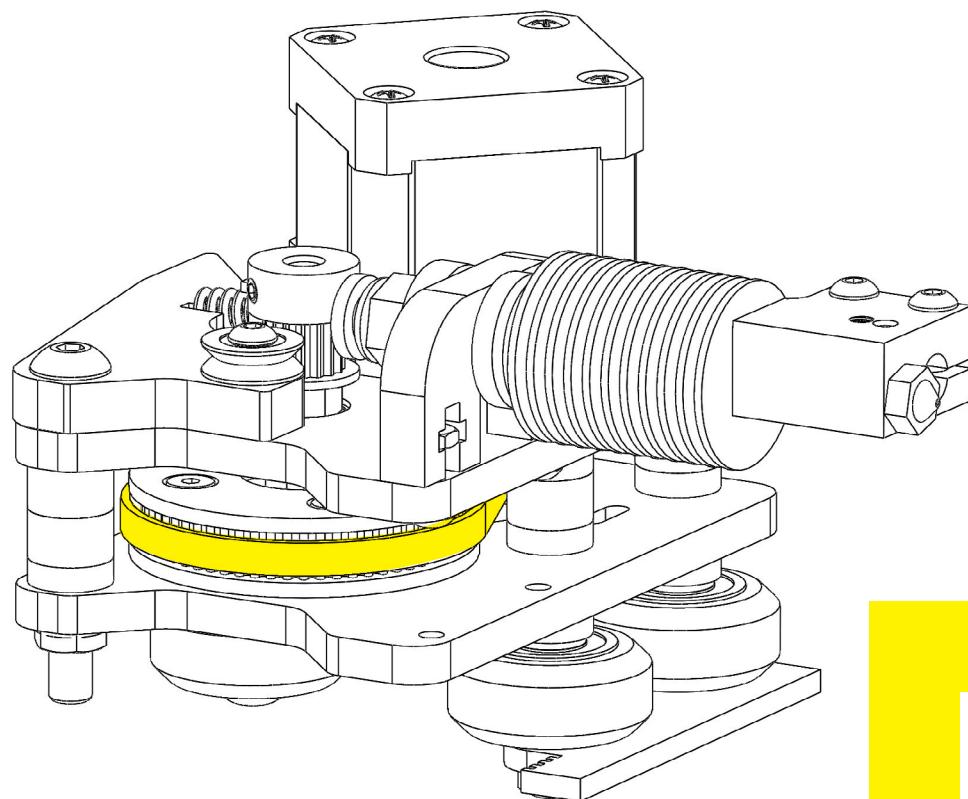


Assembly

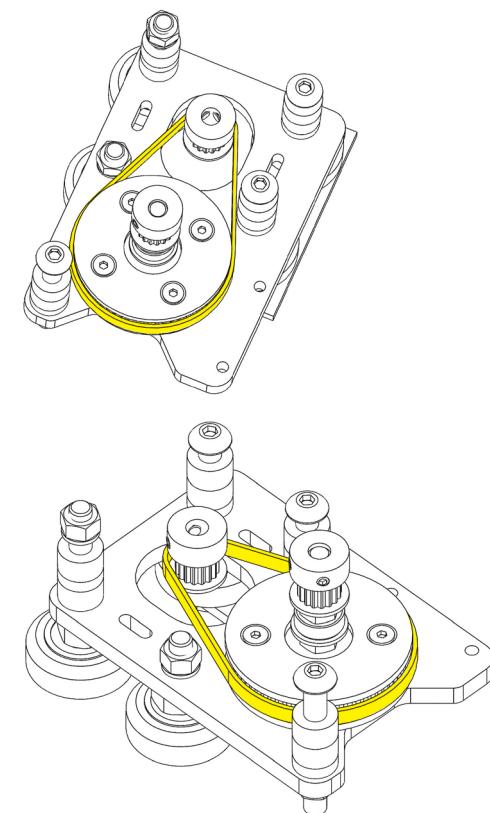
Extruder: Belt

Attach Belt

As seen below



1



Assembly

Extruder: Y axis Belt

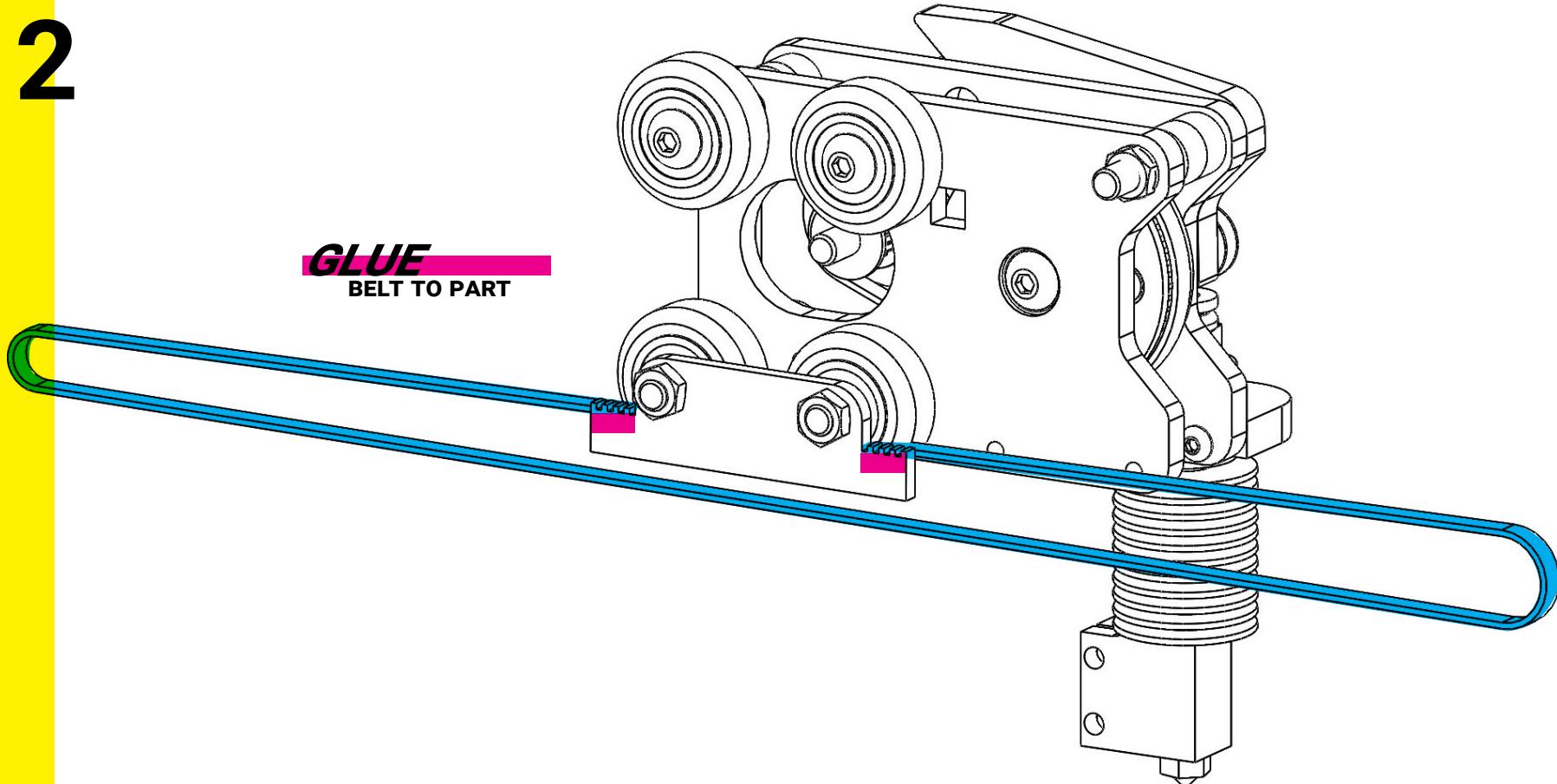
Attach Belt

As seen below



2

GLUE
BELT TO PART



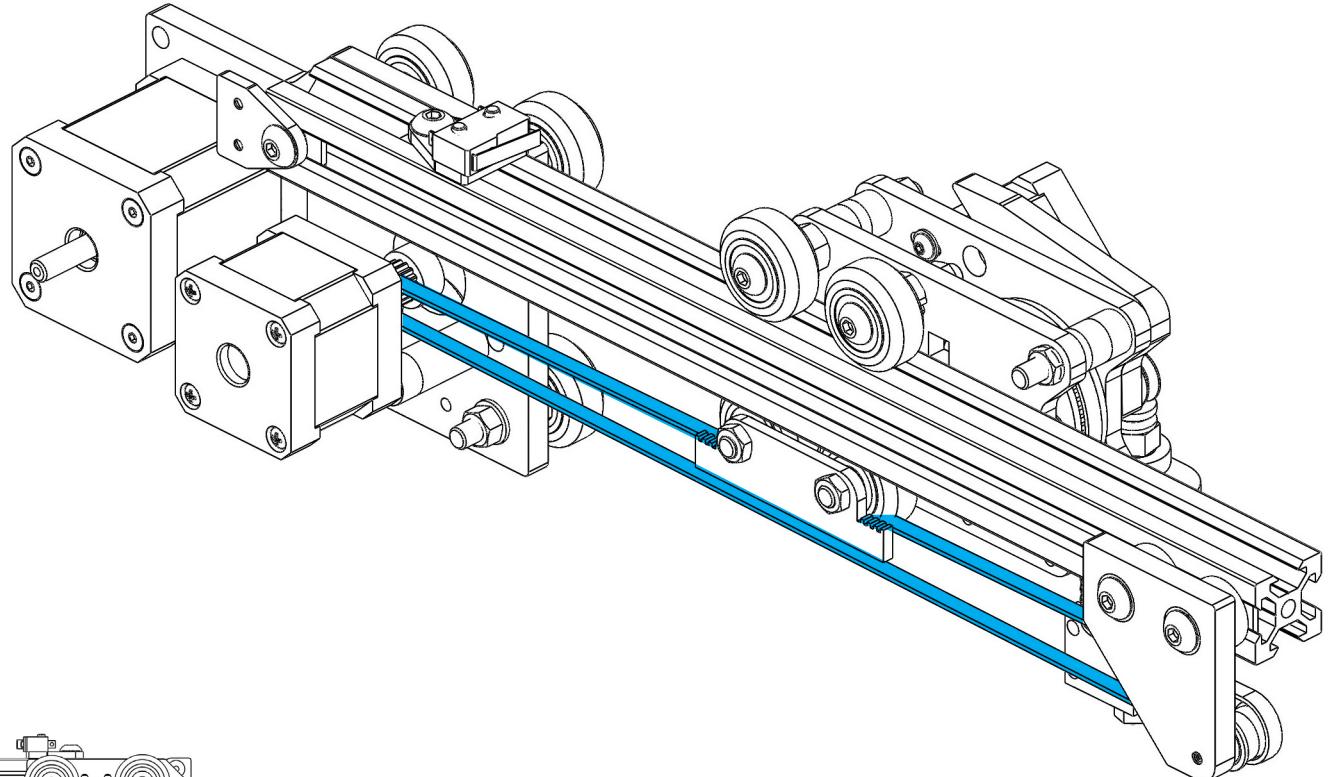
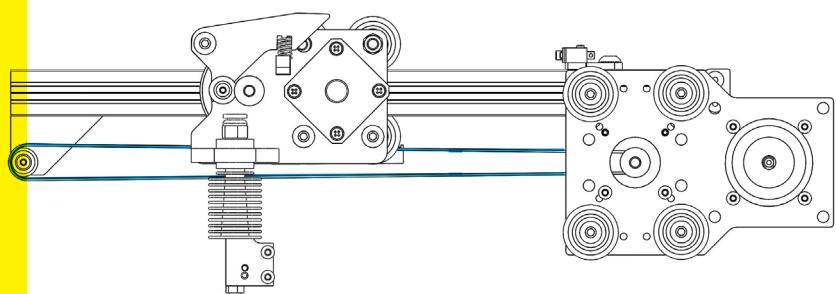
Assembly

Attach Extruder to Y Axis.

3

Attach Belt

From Extruder onto Y Axis



HINT:

SLIDE EXTRUDER ON THE RAILING FIRST.
THEN ANCHOR THE BELT ON Y-AXIS.

Assembly

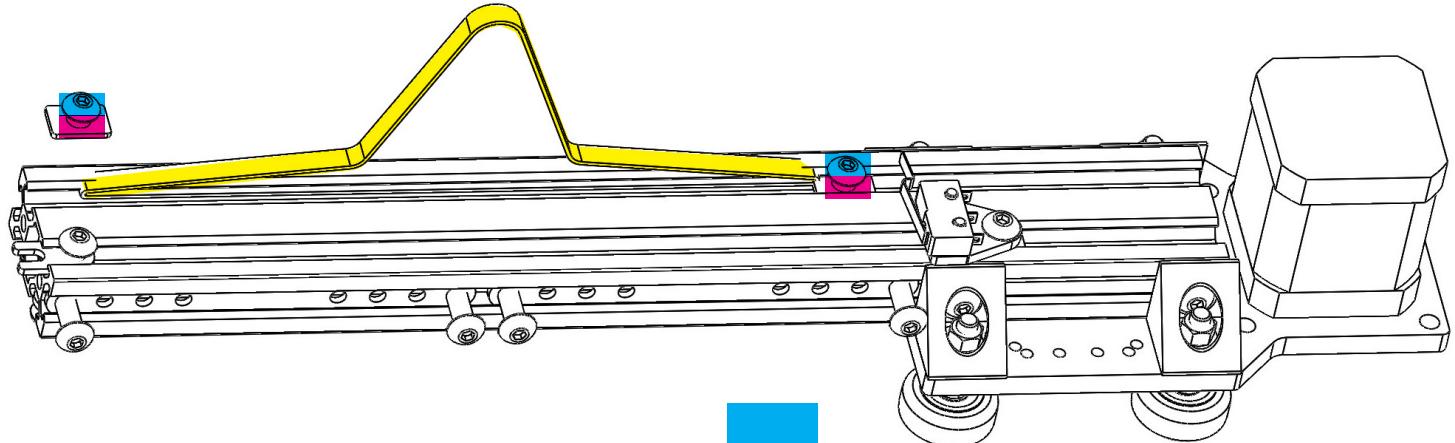
Z-axis: Belt

Attach Belt

As seen below



UNTIGHTEN
ATTACH BELT
TIGHTEN



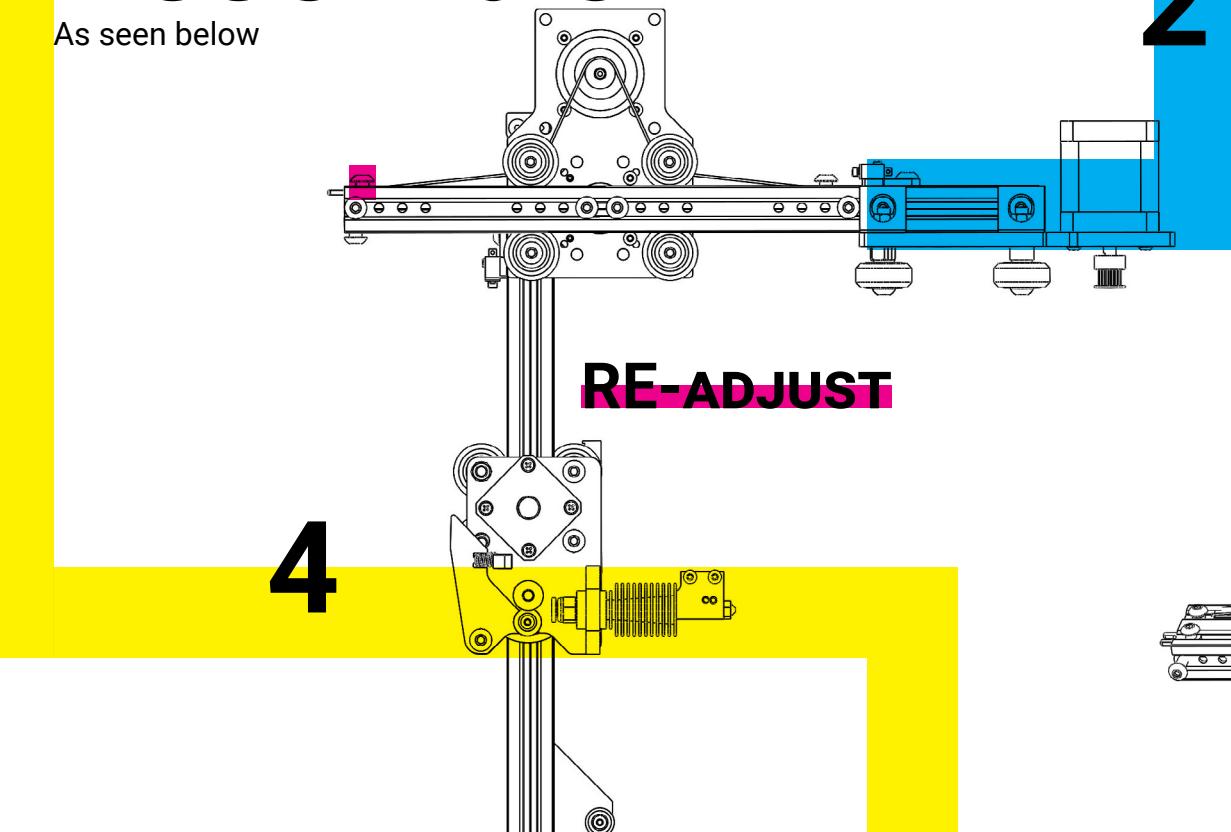
1

Assembly

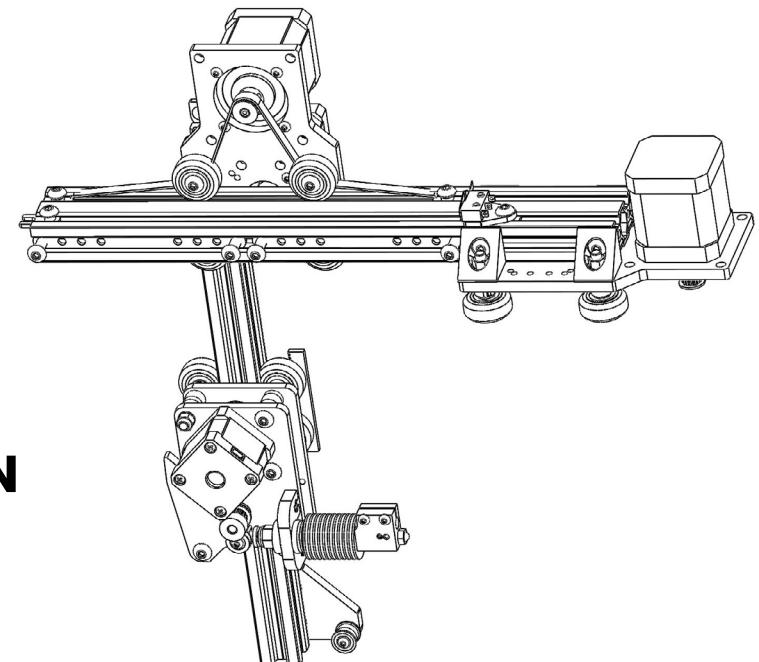
Bringing it all together

Assemble

As seen below



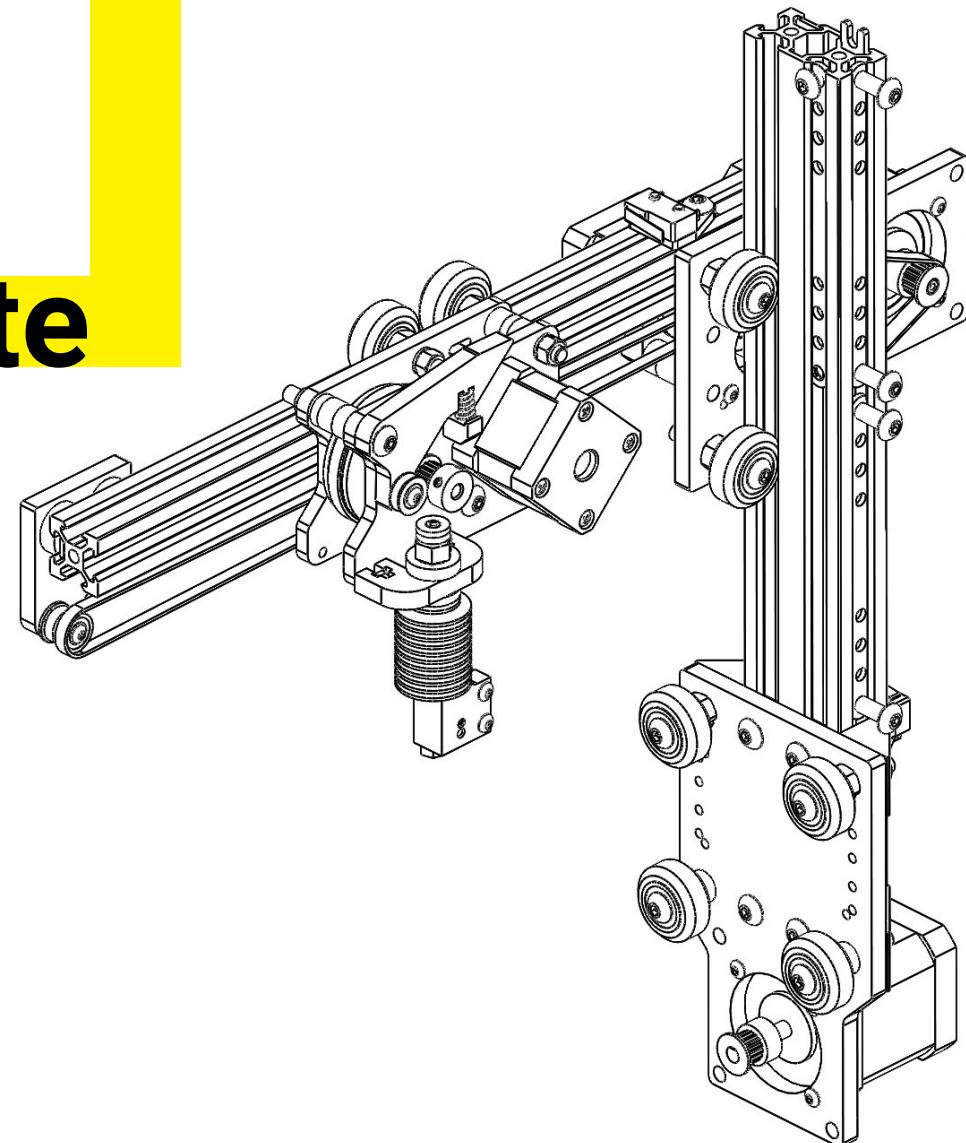
MAKE SURE ALL BELTS HAVE ADEQUATE TENSION



Assembly

Finish

Complete



Soldering and Electrical

Soldering and Electrical

Female Solder and Circuit

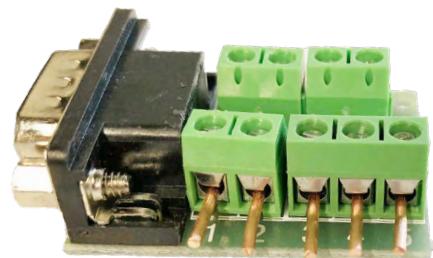
9 PIN

9 PIN

15 PIN

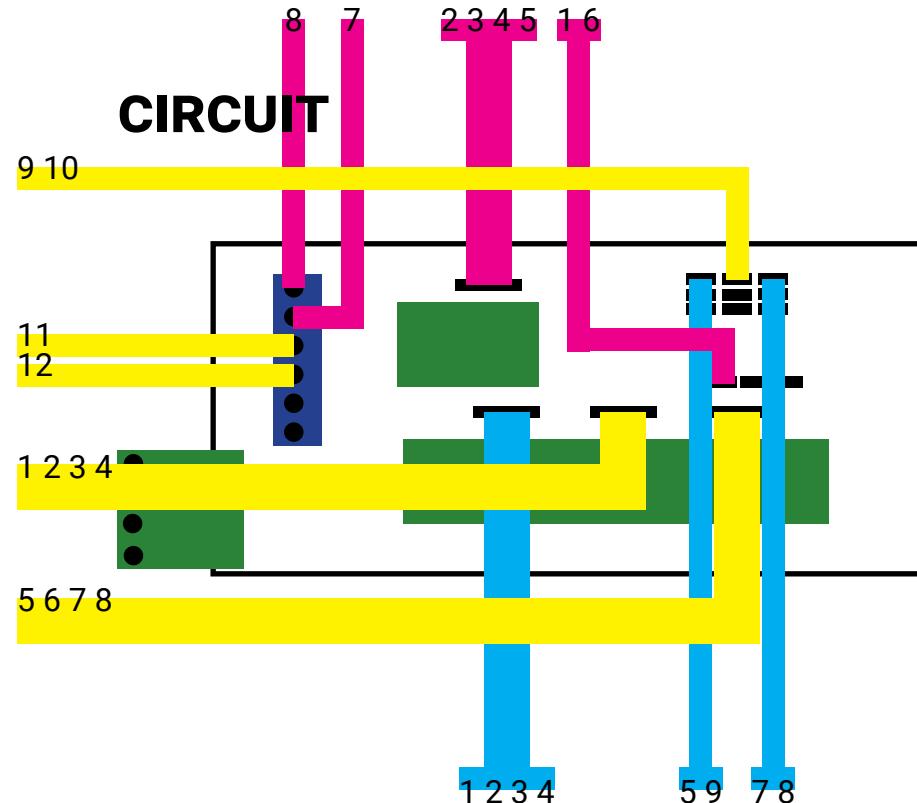
Solder

Accordingly to the number and colors



MATCH THE NUMBERS

When soldering to the Female Solder



SOLDERING INSTRUCTION

ON NEXT PAGE

Soldering and Electrical

Soldering Instruction



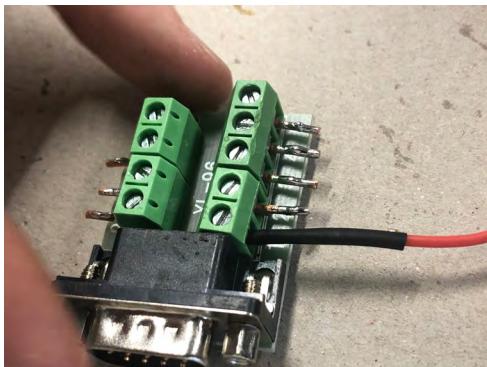
Attach Copper Wire to hole



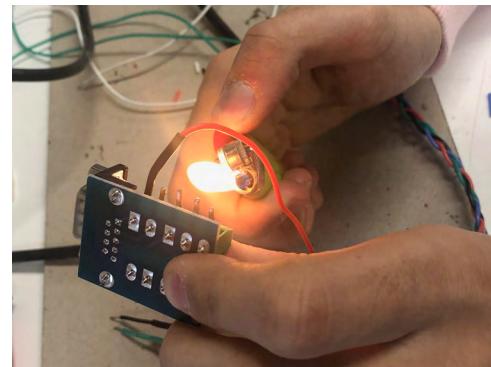
Add Solder



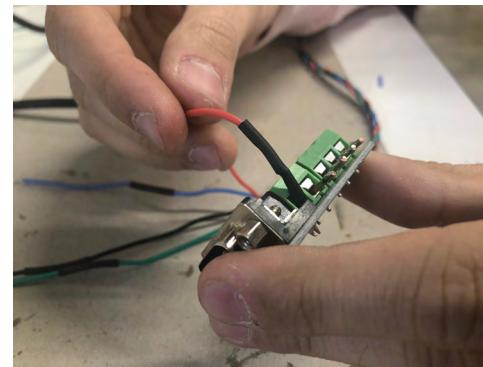
Solder wire with heat shrink



Cover exposed metal with heat shrink

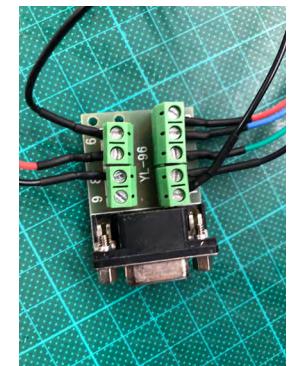


Heat the heat shrink



Repeat to all the hole necessary

EXAMPLE



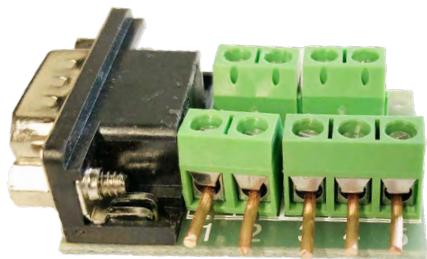
Soldering and Electrical

Attach Component to Male Solder

9 PIN

9 PIN

15 PIN



MATCH THE COMPONENTS

With number when Male Solder



BOM

EXTRUDER

4	Hex Socket Bolt, Button	M3*12
3	Hex Socket Bolt, Button	M3*8
1	Hex Socket Bolt, Button	M3*4
3	Hex Socket Bolt, Button	M5*50
2	Hex Socket Bolt, Button	M5*40
1	Hex Socket Bolt, Button	M5*30
8	Hex Socket Bolt, Countersunk	M3*6
2	Extruder Structural Plate	85*58*4.7
1	Extruder Nozzle Holder	38*21*6
1	Extruder Belt Holder	57*17*2.75
1	Spring Holder	13*8*6
1	Filament Holder Lever	61*39*6
4	Acrylic Spacer	M5*10*3
8	Acrylic Spacer	M5*10*6
1	60 Tooth Acrylic Gear	M5*38*6
2	Belt Guides	41*1.8
4	Xtreme Solid V Wheel	M5*23.9*11
1	Filament Belt	
2	Eccentric Spacer M5 Hex*6	
2	Aluminium Spacer	M5*10*6
2	Square Bolt	M3*2.3
6	Washer M5*8.4*1	
3	Washer M3*7*.65	
3	Washer M5*10*1	
2	Stepped Bearing M5*12.5*5	
1	Notched Bearing	M3*12*4
6	Hex Nut M5*4.5	
2	Hex Nut M5*3	
1	Spring 6*11	
1	Extruder Heatsink	43*22.5
1	Threaded Heatsink Connector	7*22.25
1	Threaded Filament Guide	44*10

Y AXIS

1	Heat Transfer Block	11.5*20.5*20.5
1	Nozzle	21*7
1	Timing Pulley 16 Tooth	13*14
1	Toothed Filament Wheel	M5*11*11
1	PrimoPal Stepper Motor	35*35*58
1	Heating Wire	
1	Thermostat Wire	
1	Extruder Movement Belt	
1	Y Axis Structural Plate	116*80*6
1	Tensioning Bearing Holder	40*45*6
2	Stepped Bearing	M5*12.5*5
4	Xtreme Solid V Wheel	M5*23.9*11
1	Acrylic Spacer	M3*9*3
2	Acrylic Spacer	M5*16*6
2	Acrylic Spacer	M5*10*6
1	Washer M3*7*.65	
4	Washer M5*8.4*1	
2	Washer M5*10*1	
6	Linear Rail Bracket, Large	15*10*3.5
2	Eccentric Spacer M5 Hex*6	
2	Aluminium Spacer	M5*10*6
2	Aluminium Spacer	M5*10*20
1	Limit Switch Holder, Countersunk	24.5*19.5*3
2	Xtreme Solid V Wheel	M5*23.9*11
1	OSM Stepper Motor Small	42*42*62.5
1	Timing Pulley 16 Tooth	13*14
4	Washer M5*8.4*1	
4	Linear Rail Bracket, Small	10*6*4.25
7	Linear Rail Bracket, Large	15*10*3.5
2	Aluminium Spacer	M5*10*6
1	V-Slot Linear Rail	300*20*40
2	Eccentric Spacer M5 Hex*6	
1	Z Axis Movement Belt	

Documentation

Documentation

Why CAD?

PHOTOGRAPHY

CANT CAPTURE DETAIL
TOO MANY BLACK COMPONENTS

ASSUMING HAVE ACCESS TO THE PARTS AT ALL TIME **NOT TRUE**

Why CAD?

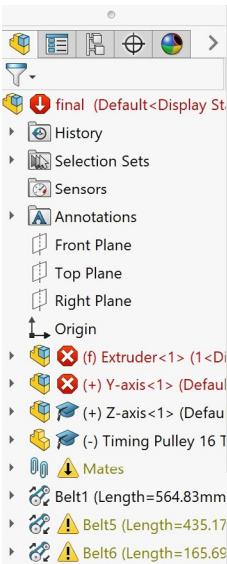
HARD TO GET FINE DETAIL
DRAWINGS

TIME CONSUMING AND INEFFICIENT

Documentation

Solid Works and CAD

 **TOTAL NUMBER OF
COMPONENTS IN
THE FINAL BUILD**



SO many Errors due to using components of same name but from different location.

Luckily it doesn't affect the visuals

LESSON LEARNT

Learnt to use ASSEMBLED ALL COMPONENTS solidworks



ORGANISE COMPONENTS

INTO PARTS

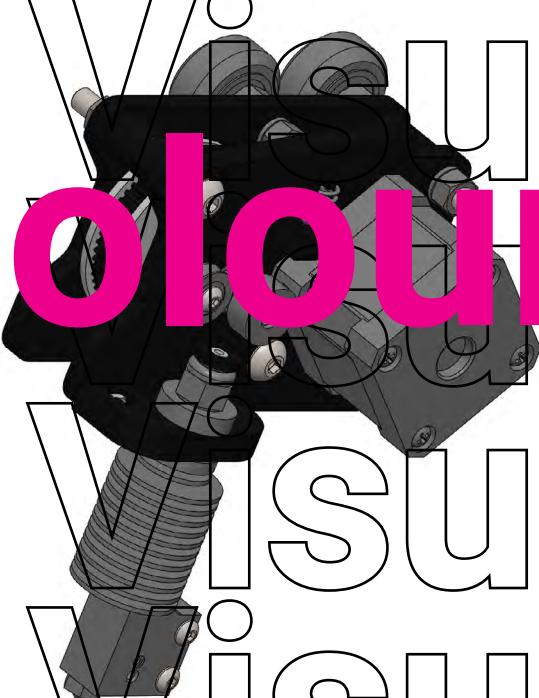
Make components easier to find and adjust when making exploded view

- ▶  Extruder (1<Display State-1>)
- ▶  History
- ▶  Sensors
- ▶  Annotations
- ▶  Front Plane
- ▶  Top Plane
- ▶  Right Plane
- ▶  Origin
- ▶  Wheel 1
- ▶  Wheel 4
- ▶  Triangle
- ▶  Engine
- ▶  Spring
- ▶  Connect triangle to main
- ▶  Extruder holder
- ▶  Wheel 2
- ▶  Wheel 3
- ▶  Extruder
- ▶  (-) Wheel<1> (Default<Display State-1>)
- ▶  (-) Extruder Structural Plate v1<1>
- ▶  (f) Extruder Structural Plate v1<1>
- ▶  (-) Extruder Belt Holder v1<1>
- ▶  Mates

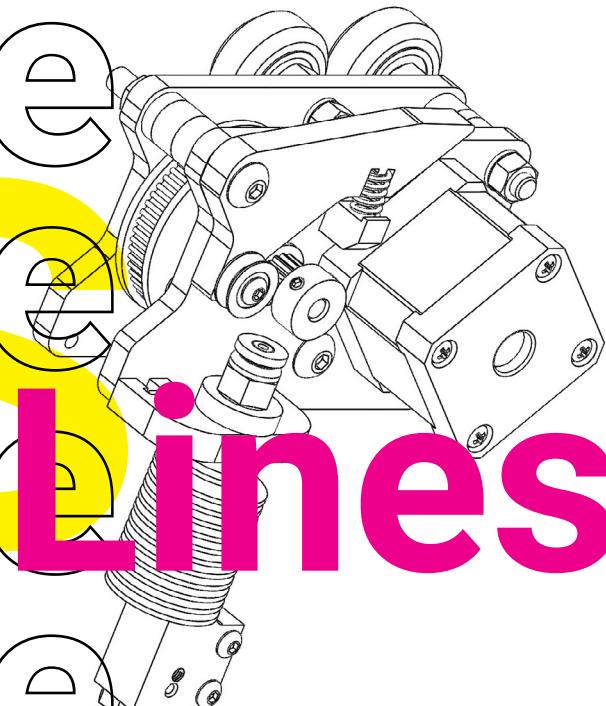
Documentation

Visual style

Colours



Style Lines



LINES GIVES BETTER DETAILS

Rendering with colors detracts from the detail because sometimes the edges are hard to see.

VISUAL DESIGN

Documentation

Visual Design

Inspired by

**METRO MAP
WEB AND APP DESIGN
PRINTING**

Vertica

The Digital Media relies a lot on scrolling. The most common type of scrolling is the vertical scroll. Hence wayfinding for digital media should be mainly **vertical**.

LINES

Inspired by **metro maps**, I thought that using lines to do wayfinding, and guide the eyes with colors as a way to bring attention to certain things would be interesting.

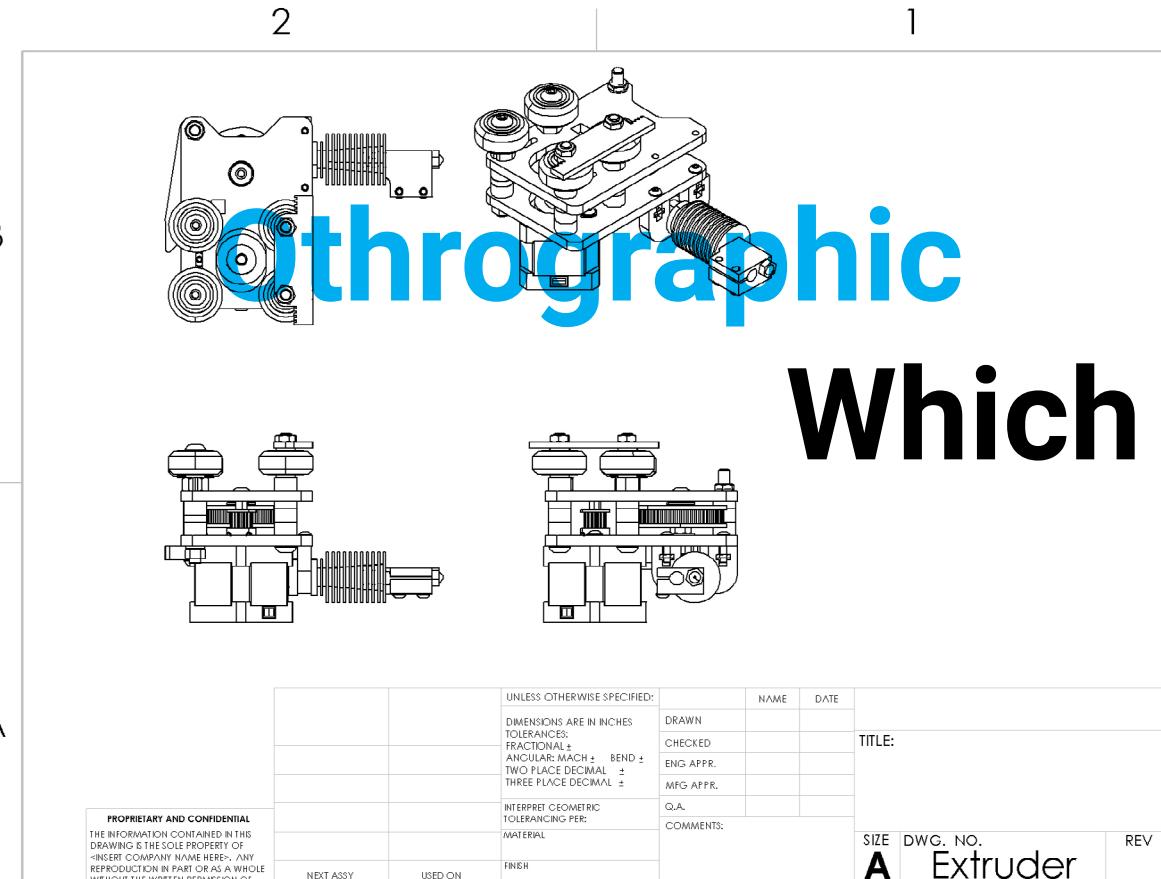
C
M
Y
K

Despite being designed for screens and digital viewing, I want to bring a homage of **traditional medium** back, hence my usage of the CMYK colours.

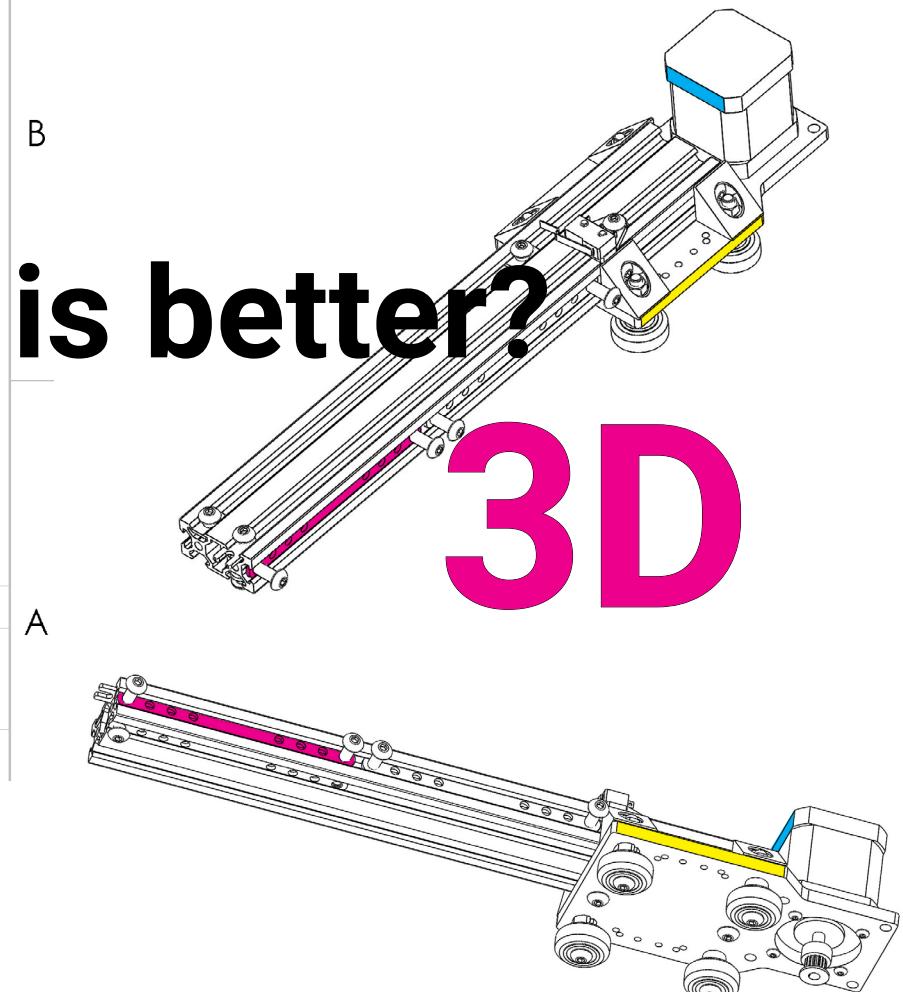
Outside of that I find the CMYK colors striking with **high contrast** between the colours. Hence I thought that it would be a good way guide the reader's attention to parts of the document.

Documentation

What is the best way to visualize?



I AM STILL QUITE Undecided



Credit

CAD parts: Josh Szabo

Assemble 3D Printer: WILDCATS Group

Solidworks Lesson: Linkedin Learning

Photogrpahed Hands: Josh Szabo

CAD software: Solidworks 2018-2019

Reflection

Within the process of building the 3D printer and making the manual, I had to learn a lot of new skills while re-learning old skills. After seeing the complexity of the 3D printer, I decided that CAD would be the most efficient way to document and visualize. Outside of making the manual, the 3D printer was also difficult as I had to learn how to tap screws and re-learn skills such as soldering.

In the making of the manual, I struggled with working with Solidworks. Since I have minimal knowledge on CAD, I had to pick the basic of CAD so that I can contribute the class's CAD database. I also ran into a lot of problems with Josh working on Fusion 360, and me working on Solidworks. I couldn't contribute much to the components database, but I was able to autonomies the conversion of files and Assembled the components in Solidworks, which I added to the database.

The visual storytelling of "how to build a 3D printer" was also a difficult one. I struggled on balancing the technical information, visual appearance, and the viewer experience. I tried leave each page with a lot of negative space for the viewer to breath and take in the information in small chunks, yet if I make every small step into a page of its own, the manual would be too long and detracts from the viewing experience. The technical information's are a struggle to visualize as I must find the Right angle (pun unintended) or multiple angles to view from. I tried using colours as a way finder and indications which the effectiveness of it varies throughout.

I hope that I had more time to work on the manual, as I barely got a chance to iterate from the feedbacks received.