

# ENDER 3 NG

## BUILD GUIDE

V1.2

DESIGNED BY RH3D

WEBSITE  
PRINTABLES  
DISCORD  
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YOUTUBE  
INSTAGRAM

VERSION 0.1-2025/01

# INTRODUCTION

## CAUTION!

Ender 3 NG ( E3NG ) is a hobby DIY project. The final product quality will highly depend on your skills, quality of printed parts and materials used.

You will be working with systems which can be dangerous and have the potential to cause harm. This includes high voltages, hot surfaces and fast moving parts. Before you decide to build an Ender 3 NG, make sure you understand all the risks involved, follow your local regulations and if needed, enlist the help of a qualified professional. Don't leave the printer running unattended and never leave children to operate it without adult supervision.

Read this build guide carefully, but don't take it as a definitive step by step instructions, rather as a document that will guide you through the build process. If you are unsure about anything, re-read the section you are working on to check you have not missed a step. If you still don't find the answer, you may find it on our friendly discord server or in the CAD assembly files. Links to both can be found on the front page of this manual.

The project has many variations and possible configuration options so you can choose your personal best version but it makes starting the project a bit more complex. Before beginning to print parts, you should first read through the website, compare the configuration options and gain an overall understanding of the project and its features. Before you start building the E3NG, read through the build guide to make sure you understand the build process.

Happy building and printing and good luck.

Radek @RH3D

This project wouldn't be possible without people who support it either by using affiliate links or donating directly, thank you to each and every one of you!

This build manual is the first public release so if you find any mistakes or have any recommendations, your feedback will be very welcome.

[FEEDBACK](#)

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# BEFORE YOU START

## GENERAL PRINTER CALIBRATION

The E3NG frame design has some printed parts used for frame joints so the squareness is relying on their quality. To achieve the best results, it is crucial to do a proper calibration of your printer. Do the calibration steps as mentioned below with the filament you will be printing the E3NG parts with.

[ELLI'S PRINT TUNING GUIDE](#) – one of the most comprehensive and up to date tuning guides for 3D printers that will guide you from A to Z to get the best out of your printer.

## SKEW AND SHRINKAGE CALIBRATION

Below you can find various calibration models, choose the one that fits you best.

XY axis – [CALISTAR \(Fleur de Cali\)](#) from dirdigger

XY axis – [CALIFLOWER](#) from Vector 3D

XYZ axis – [CALILANTERN](#) from Vector 3D

## CALIBRATION / TEST PRINT

To test the project tolerances and some of its features, print the [CALIBRATION CUBE](#), it has various design features as shown on the model page.

## ENDER 3 NG PROJECT PREPARATION

To get ready for the build, go through the [project website](#) and read all the necessary instructions and guidelines:

[PRINTING PARAMETERS, MATERIAL SELECTION](#)

[PRINTER CONFIGURATION](#) – Read carefully to decide on the options that best suit your needs. If you need help don't hesitate to ask on the Discord server or follow the recommended options.

[FREQUENTLY ASKED QUESTIONS](#)

[CHOOSE YOUR COLOR SCHEME](#)

## BUILD GUIDE CONTENT

The current build guide version includes the build of the base printer with most of its configuration options, but it doesn't include the enclosure assembly and other optional parts. These are not necessary or hard to build and will come in the future updated version of the build guide.

## BUILD NOTES LEGEND

### WARNING:

Important step that is necessary to follow. Skipping this step may lead to incorrectly installed parts.

### NOTE:

Important step for the build process. You can skip this step and come back to it later without any complications.

### TIP:

Helpful and optional tips for the build process. May save you time or work but not necessarily.

### CONFIGURATION NOTE:

This note indicates a specific step, which applies only to certain selection in the configurator. If this doesn't apply to your selection, skip the step.

If it is on the left top corner of the page, it means the entire page is dedicated to the mentioned option so if it doesn't apply to your build, skip the entire page.

Build step description.

# TOOLS AND TERMINOLOGY

## REQUIRED TOOLS

- Drill bits for metals ( 3.3 mm; 4 mm ) + electric drill
- Thread taps ( M4; M5 )
- Allen keys ( 1.5mm; 2mm; 2.5mm; 3mm; 4mm )
- Glue to bond plastics ( superglue is fine )
- Heat insert tool ( soldering iron or heat insert press )
- Soldering tools ( soldering iron; solder; soldering flux )
- Tape measure ( 550 mm at least )
- Wire snip pliers
- Exacto knife
- Marker
- Isopropyl alcohol ( IPA )
- Grease ( for Linear Motion bearings )
- Paper wipes

## RECOMMENDED TOOLS

- Ball end allen key ( 2.5 mm; 3 mm )
- Hole reamer ( 3 mm; 4 mm; 5 mm; 8 mm; 12 mm )
- File
- Center punch
- Wire stripper
- Crimping pliers
- Scissors
- Masking tape
- 1-2-3 blocks or a precision square

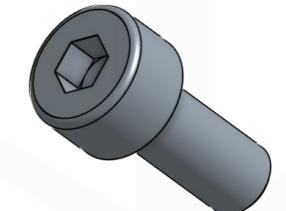
## TERMINOLOGY USED IN THE GUIDE

Below you will find some helpful explanations ( with examples ) for terms and abbreviations used in the build guide. Other hardware specifications can be found in the Bill of Material.

### M4x10 SHCS

Socked head cap screw.

M4 thread, 10mm thread length.



### M5x20 BHCS

Button head cap screw.

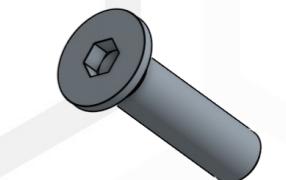
M5 thread, 20mm thread length.



### M3x12 FHCS

Flat head countersunk screw.

M3 thread, 12mm overall length.



### M3 HEAT SET INSERT

Outer diameter 4.5 mm, length 4 mm, M3 thread.



Hole in the printed part 4.1 mm diameter.

### M5 HEAT SET INSERT

Outer diameter 7 mm, length 5 mm, M5 thread.

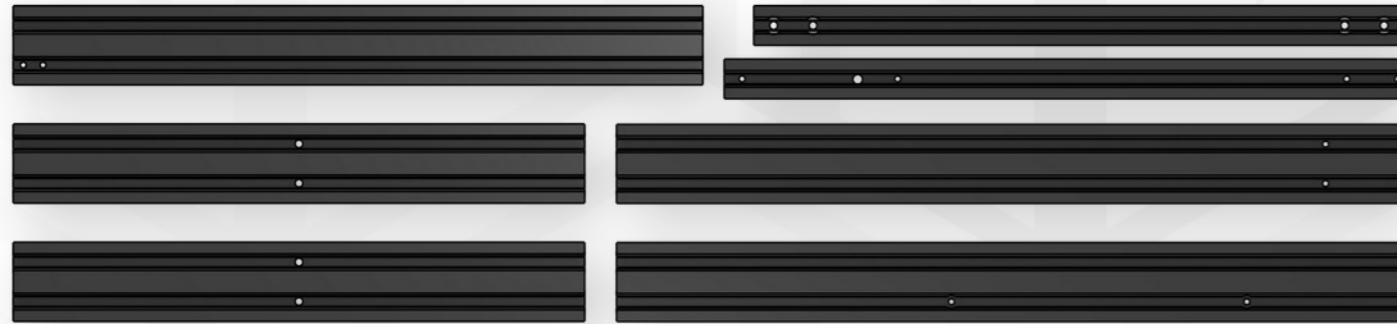


Hole in the printed part 6.4 mm diameter.

# PARTS PREPARATION

## V-SLOT EXTRUSIONS

Make sure all extrusions are the right size, required dimensions are listed in the official BOM. The only exception is the original Y axis extrusion where you can use spacer or adapter to fit the requirements of the project. You also need to have the extrusion end holes tapped with M5 thread. Usually only the original X axis extrusion isn't tapped.

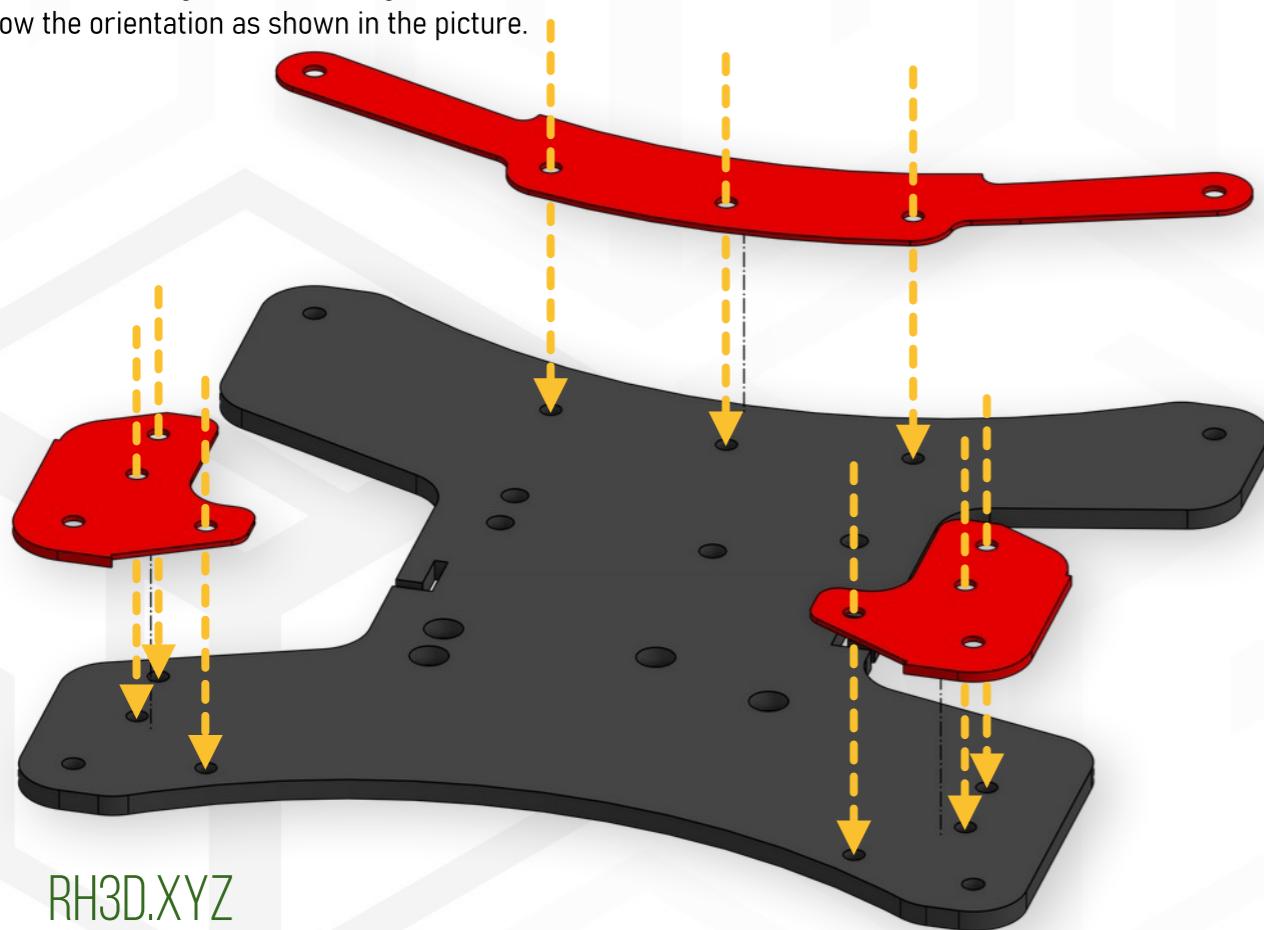


## BED CARRIAGE

For the „STOCK E3 BED PLATE“ version of the bed carriage, you need to drill 9 holes 3.3 mm OD into the original aluminium bed carriage plate and tap them to M4 threads. Use the following printable templates:

[bed\\_carriage\\_stock\\_drill\\_left.stl](#)  
[bed\\_carriage\\_stock\\_drill\\_rear.stl](#)  
[bed\\_carriage\\_stock\\_drill\\_right.stl](#)

Follow the orientation as shown in the picture.

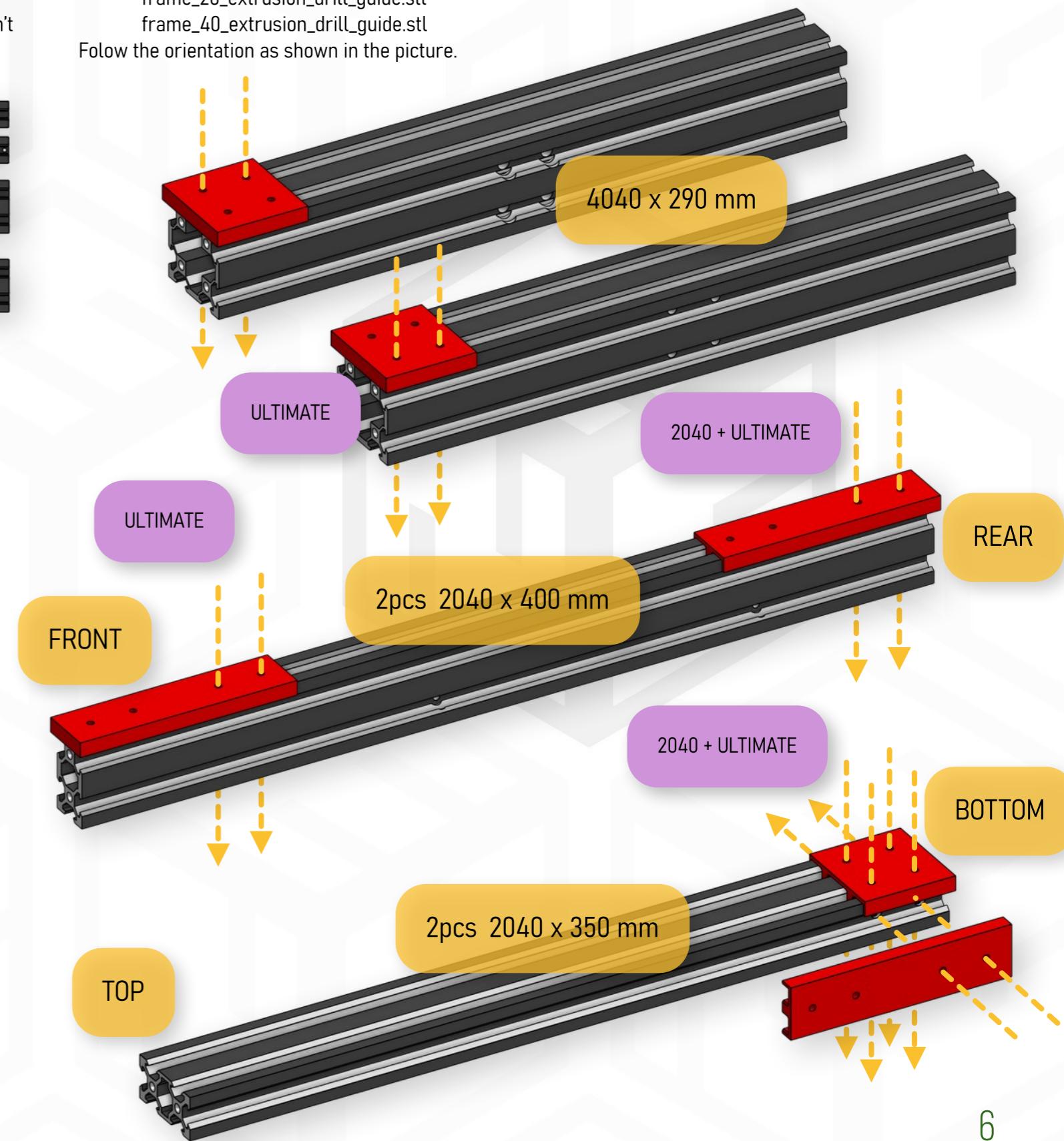


## BLIND JOINTS

If you are building the 2040 extrusion upgrade or the ultimate frame version, you will need to drill 4mm holes in the extrusions and tap M5 threads in the extra 2040 extrusions end holes. Use the following printable templates:

[frame\\_20\\_extrusion\\_drill\\_guide.stl](#)  
[frame\\_40\\_extrusion\\_drill\\_guide.stl](#)

Follow the orientation as shown in the picture.



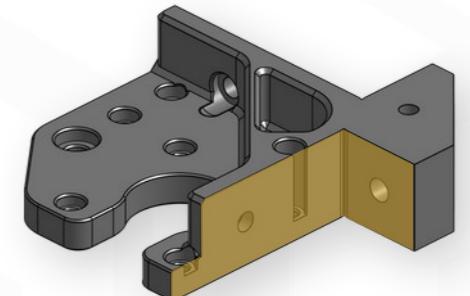
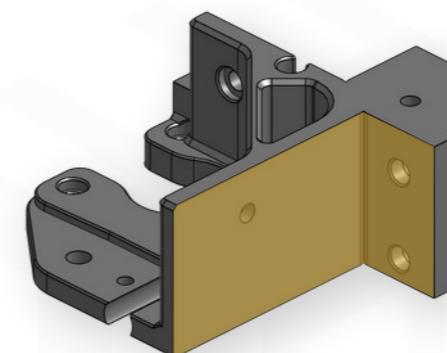
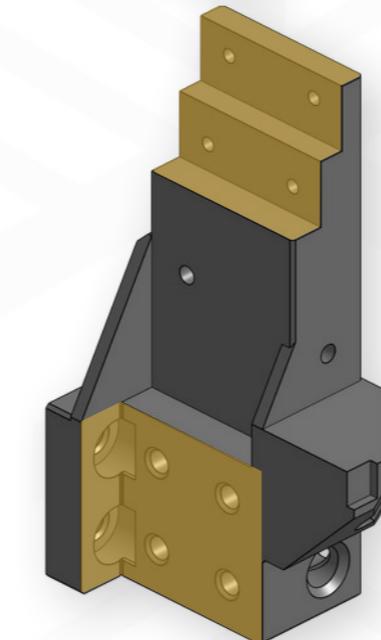
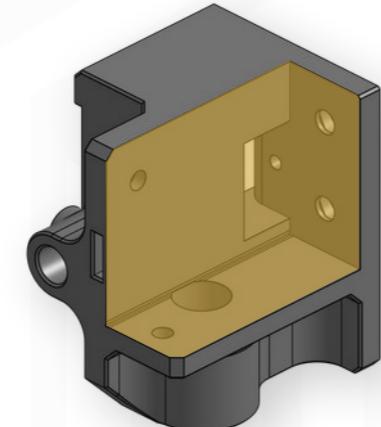
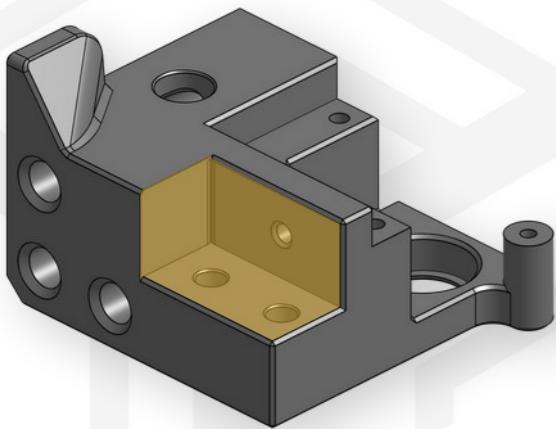
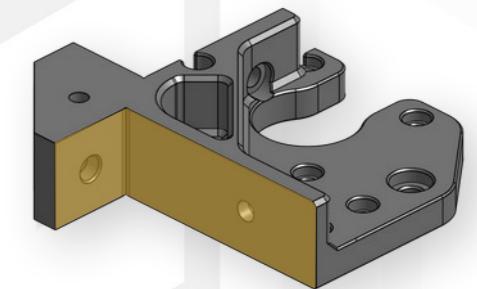
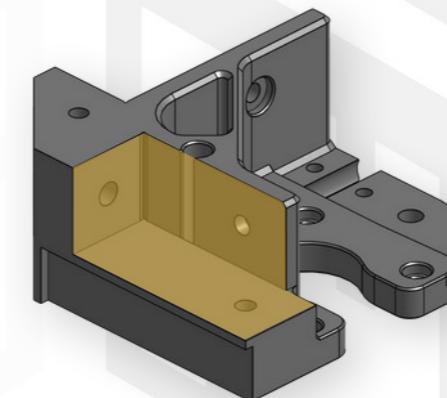
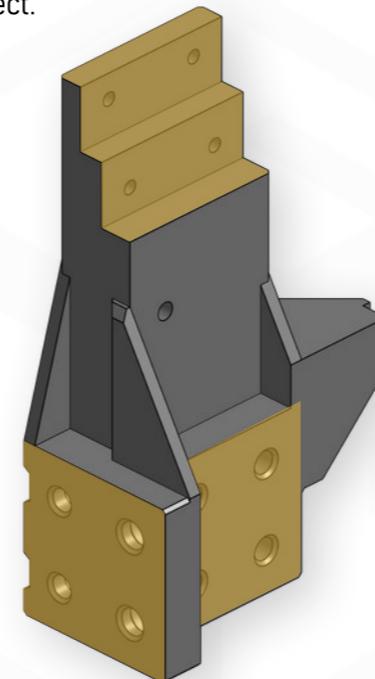
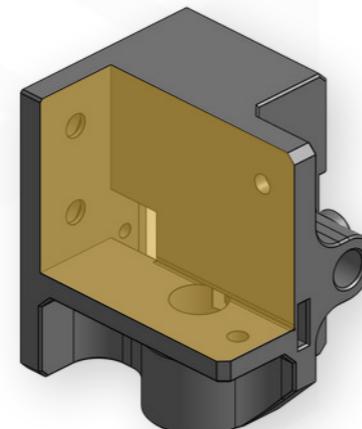
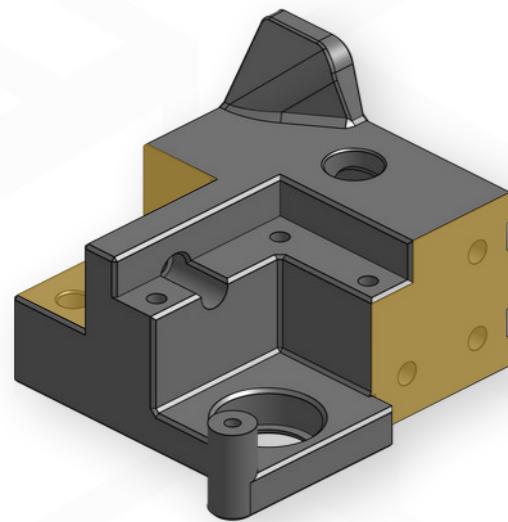
# PARTS PREPARATION

## CLEAN AND LUBRICATE LINEAR MOTION BEARINGS

New LM8LUU and LM12UU bearings need to be properly cleaned and greased before use to ensure there is no manufacturing debris or dust contaminating them and so they will run smoother, more quiet and will last longer. First, soak the bearings in a solvent such as IPA for 30 minutes and every 5-10 minutes run them on the linear rod back and forth 10 times to clean the internal channels. If the solvent becomes significantly contaminated, you can replace it with clean one or repeat the process. After being thoroughly washed, wipe them with a clean rag and let them dry completely (you can speed up the process by heating them up to 70°C). Apply grease to the inner ball traces, run the bearings on the rod and repeat to get enough grease into the channels. Some of the most commonly used grease are Mobil Mobilux EP 1 or EP 2, SuperLube 21030 or white lithium grease. Clean the excess grease.

## REFERENCE FACES

The printer frame construction relies a lot on printed parts and even though you have done proper calibration of your printer before printing parts, there still may be some imperfections that could affect the resulting frame construction. It is good to check the quality of surfaces which the extrusions are mounted to. Any blobs, bulged corners or significantly overextruded areas can affect how flat the extrusion sits against the part, so the surfaces should be reasonably flat. You can flatten/clean the surfaces with a small file or scrape it with a knife or another flat and sharp object.



# BOTTOM FRAME



## TOOLS:

Heat set insert press

## HARDWARE:

16x M3 Heat set insert (= both sides)  
6x M5 Heat set insert (= both sides)

## PRINTED PARTS:

frame\_bottom\_front\_left\_body.stl (pictured in the build guide)  
frame\_bottom\_front\_left\_cap.stl (pictured in the build guide)  
frame\_bottom\_front\_right\_body.stl  
frame\_bottom\_front\_right\_cap.stl

# BOTTOM FRAME FRONT CORNERS

## INSTALLING HEAT SET INSERTS

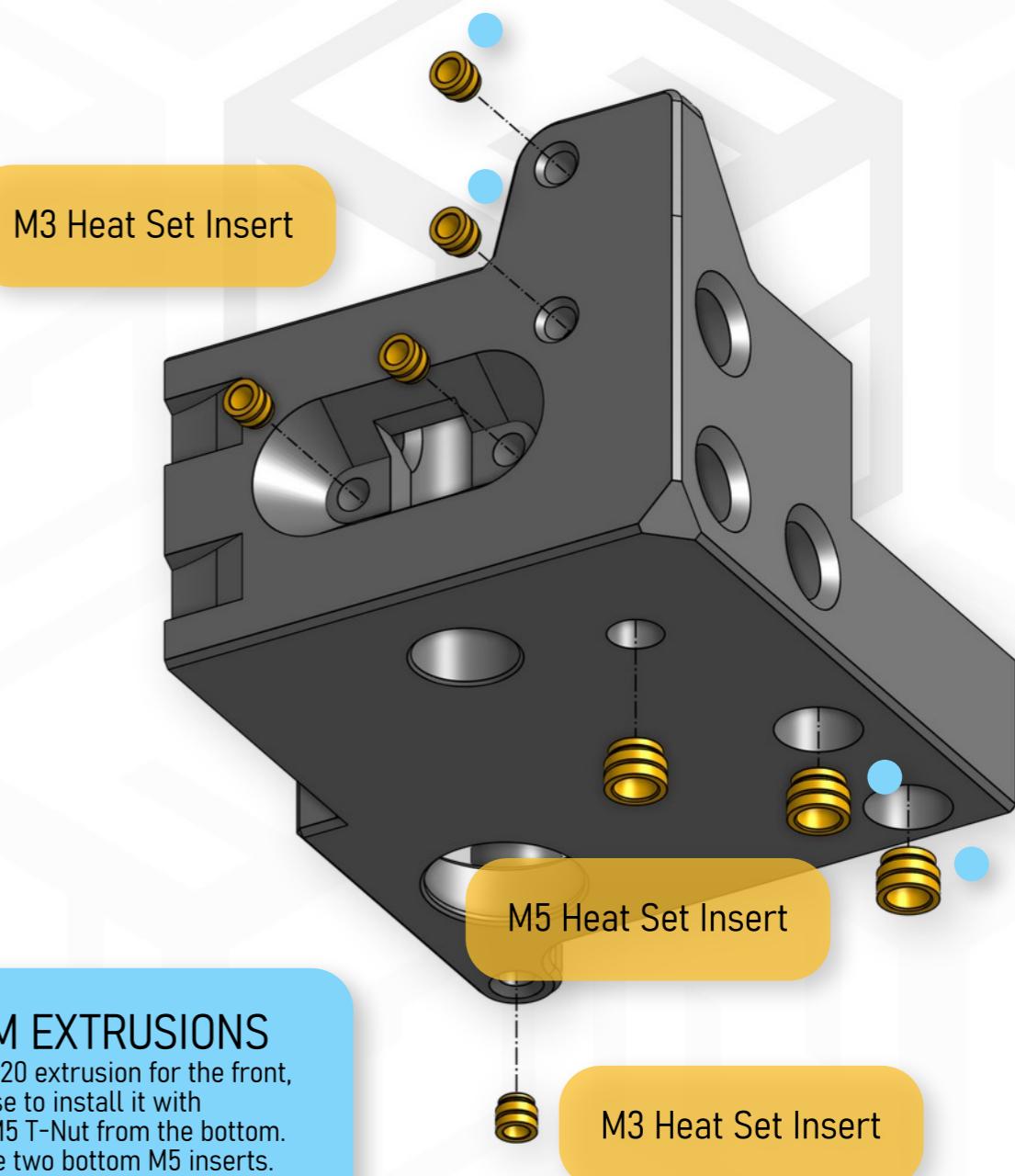
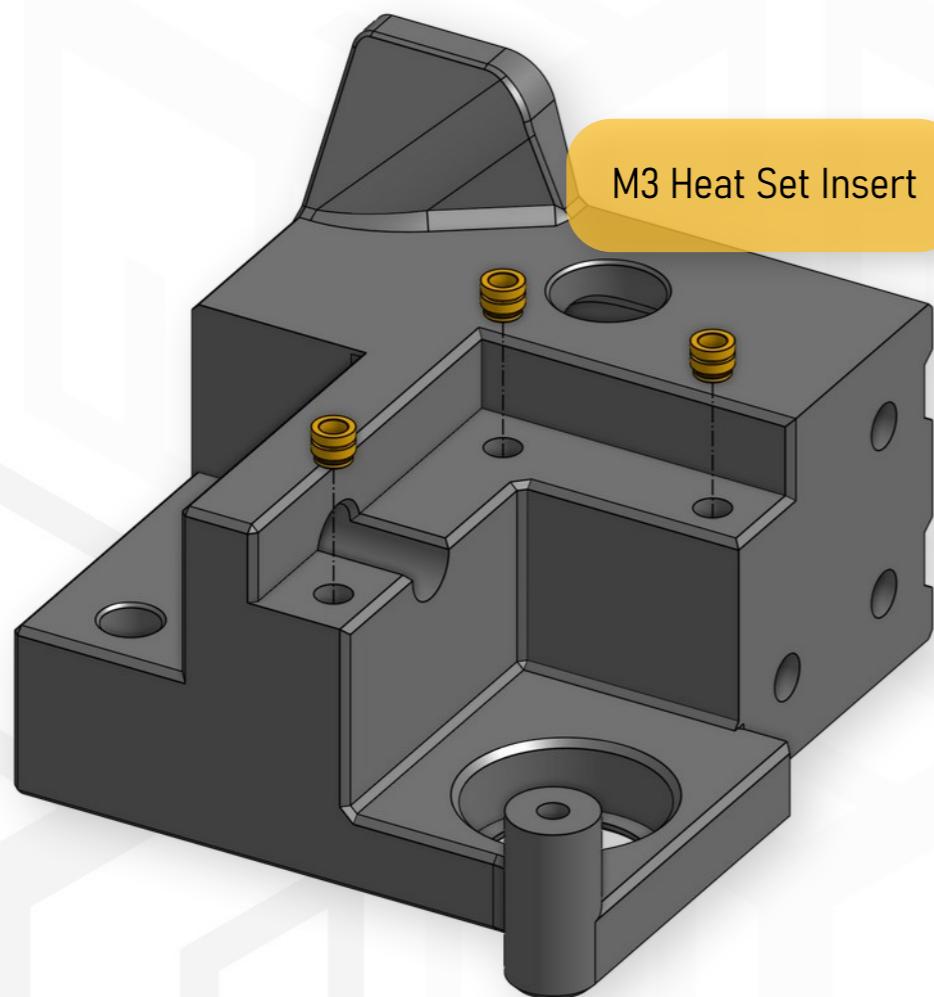
### NOTE: SYMMETRY

Left and right front corners are symmetrical, therefore only one side is shown in the build guide.

Repeat the process in the entire "FRONT CORNERS" section for the other side.

### TIP: ENCLOSURE

Two marked heat inserts are used for installing the enclosure, so if you are not going to enclose the printer, you can choose not to install them.



### TIP: CUSTOM EXTRUSIONS

If you have custom 2020 extrusion for the front, You can choose to install it with 2x M5x16 SHCS and M5 T-Nut from the bottom. If so, don't install the two bottom M5 inserts.

## TOOLS:

12mm Reamer (ideally)  
12mm Drill bit or dowel with sandpaper will work too

## HARDWARE:

12mm Z axis linear rod

## PRINTED PARTS:

frame\_bottom\_front\_left\_body.stl  
frame\_bottom\_front\_right\_body.stl

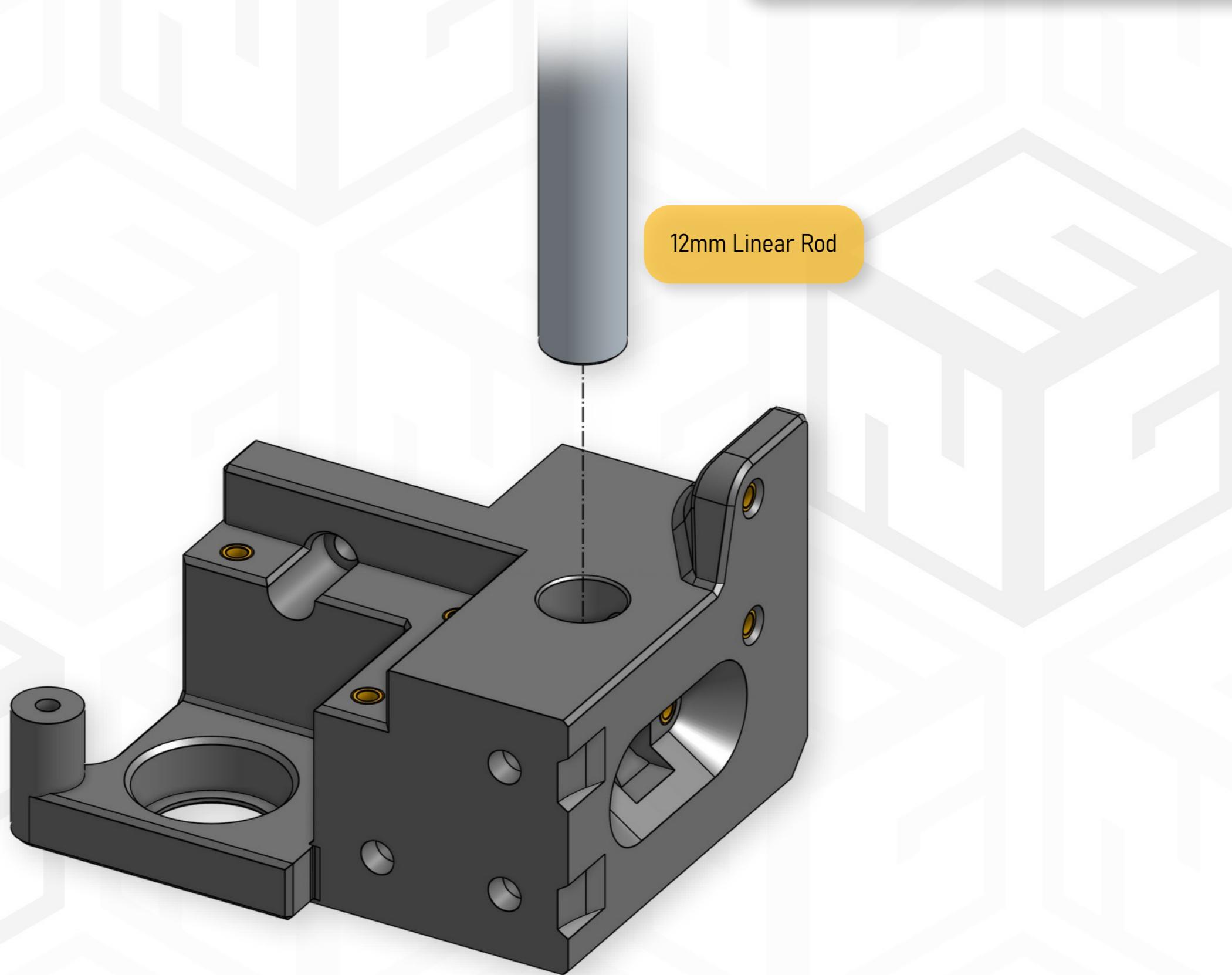
# BOTTOM FRAME FRONT CORNERS

## PROPER FIT FOR LINEAR RODS

### NOTE: PRECISION FIT

Now is the right time to verify the fit of the 12mm Z axis rods.  
If the hole is too tight, you need to clear it to make sure you can push the rod  
inside without excessive force so you will be able to remove it later if needed.

The easiest and most precise way is to use 12mm reamer (you can find one in the BOM),  
but you can also use 12mm drill bit (can still be too tight) or wooden dowel  
with sandpaper.



## TOOLS:

2.5 mm Allen key  
3 mm Allen key

## HARDWARE:

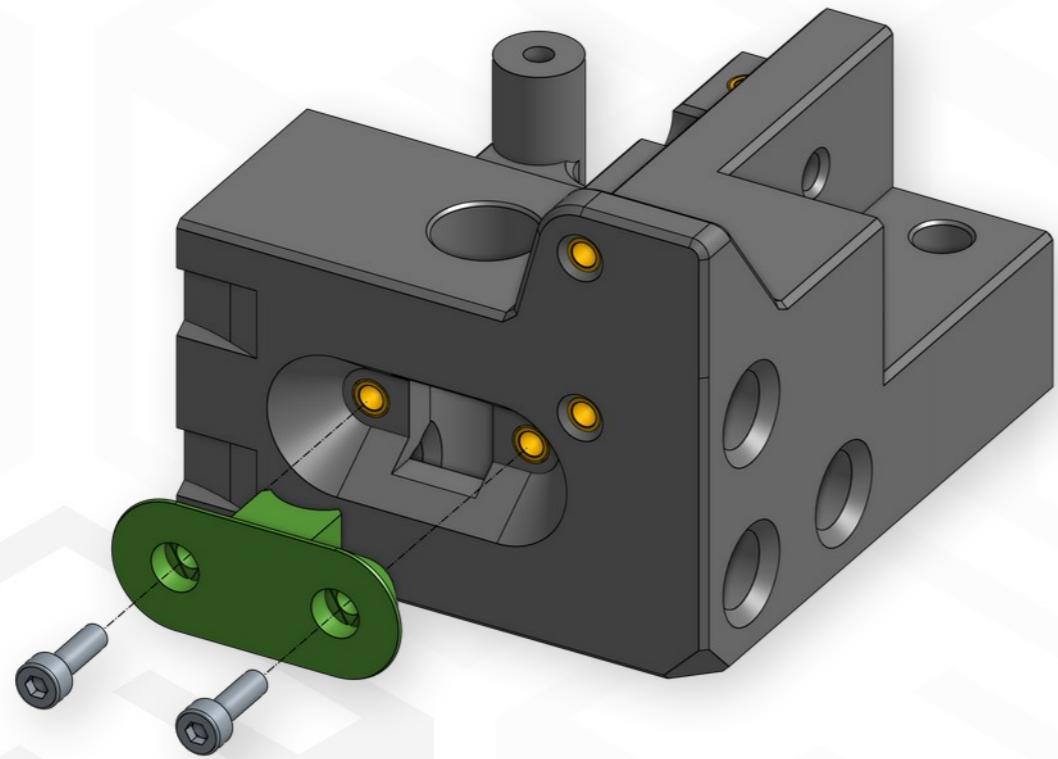
4x M3x10 SHCS (= both sides)  
2x M4x10 SHCS (= both sides)

2x M4 T-Nut (= both sides)

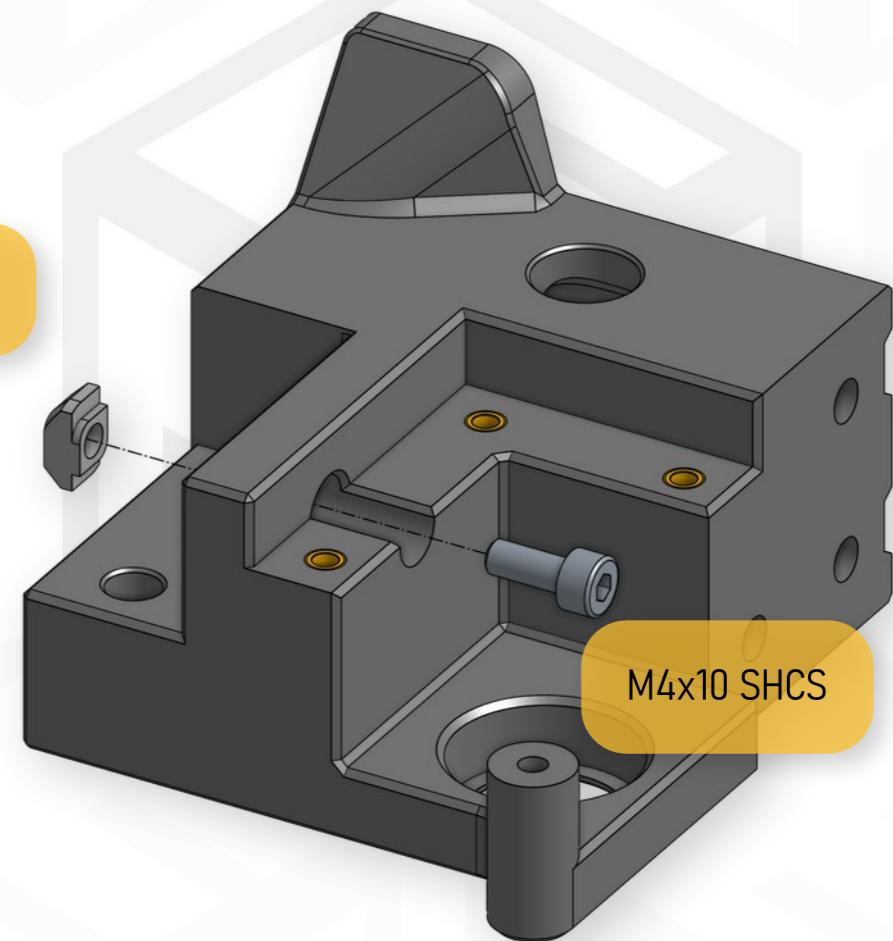
## PRINTED PARTS:

2x frame\_bottom\_front\_rod\_lock.stl (= both sides)

# BOTTOM FRAME FRONT CORNERS



M3x10 SHCS



M4 T-Nut

M4x10 SHCS

## TOOLS:

1.5 mm Allen key

## HARDWARE:

3x T8/8 x 300mm Leadscrew  
3x GT2 40T 8mm Pulley  
1x 608 2RS Ball bearing

## PRINTED PARTS:

3x frame\_bottom\_pulley\_spacer.stl

# BOTTOM FRAME FRONT CORNERS

## Z AXIS LEADSCREWS – PULLEY INSTALLATION

### PRINTED 40T PULLEY

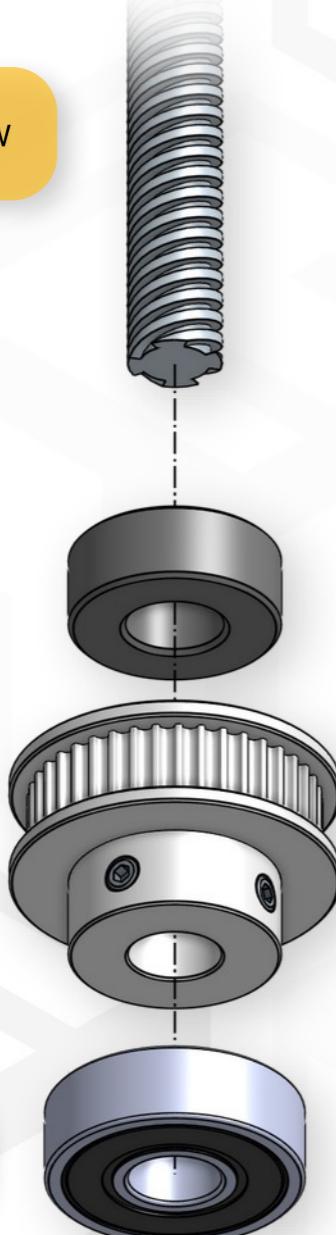
When using printed pulleys for Z axis, follow the same installation process without the printed spacer.

T8/8 300 mm Leadscrew

Printed spacer

40T GT2 Pulley

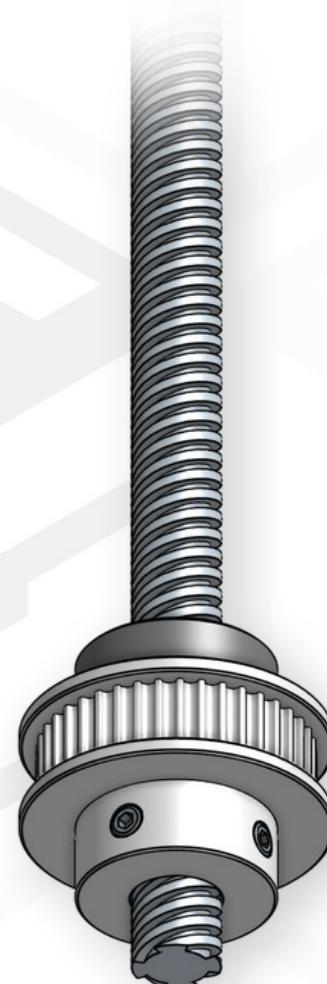
608 2RS Ball bearing



Align the bottom of the leadscrew with the bottom of the bearing.  
Tighten the pulley setscrews.



Remove the bottom bearing.



## HARDWARE:

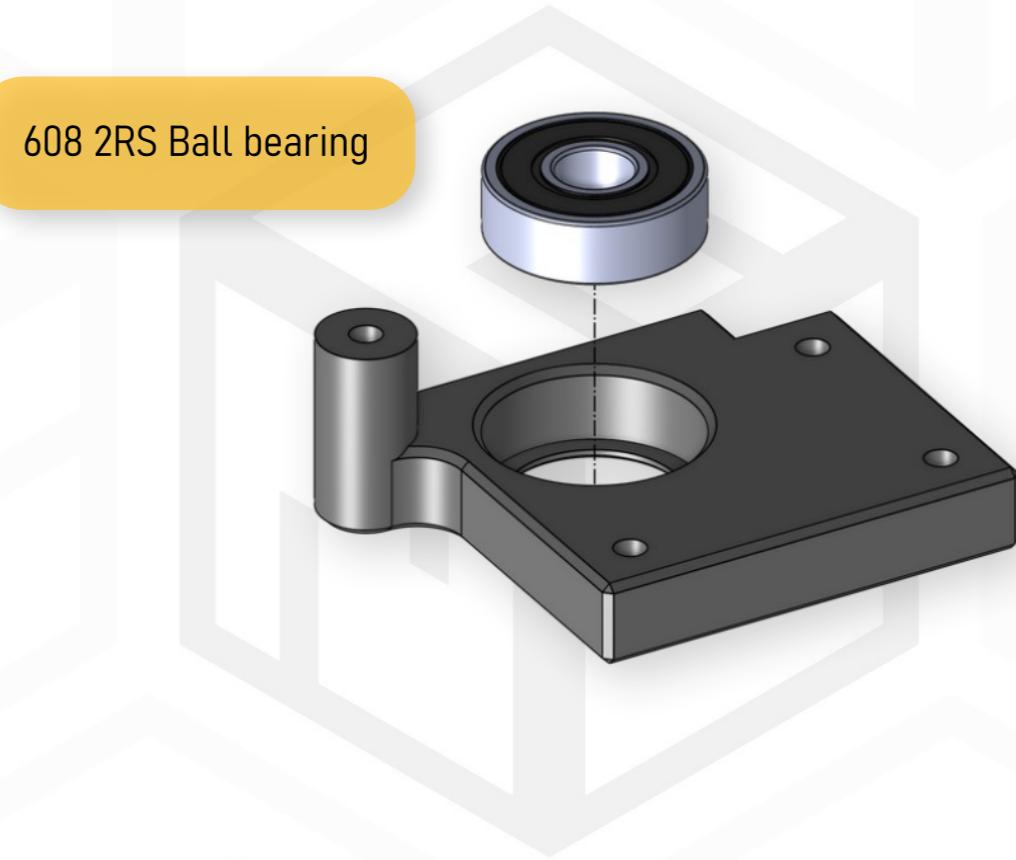
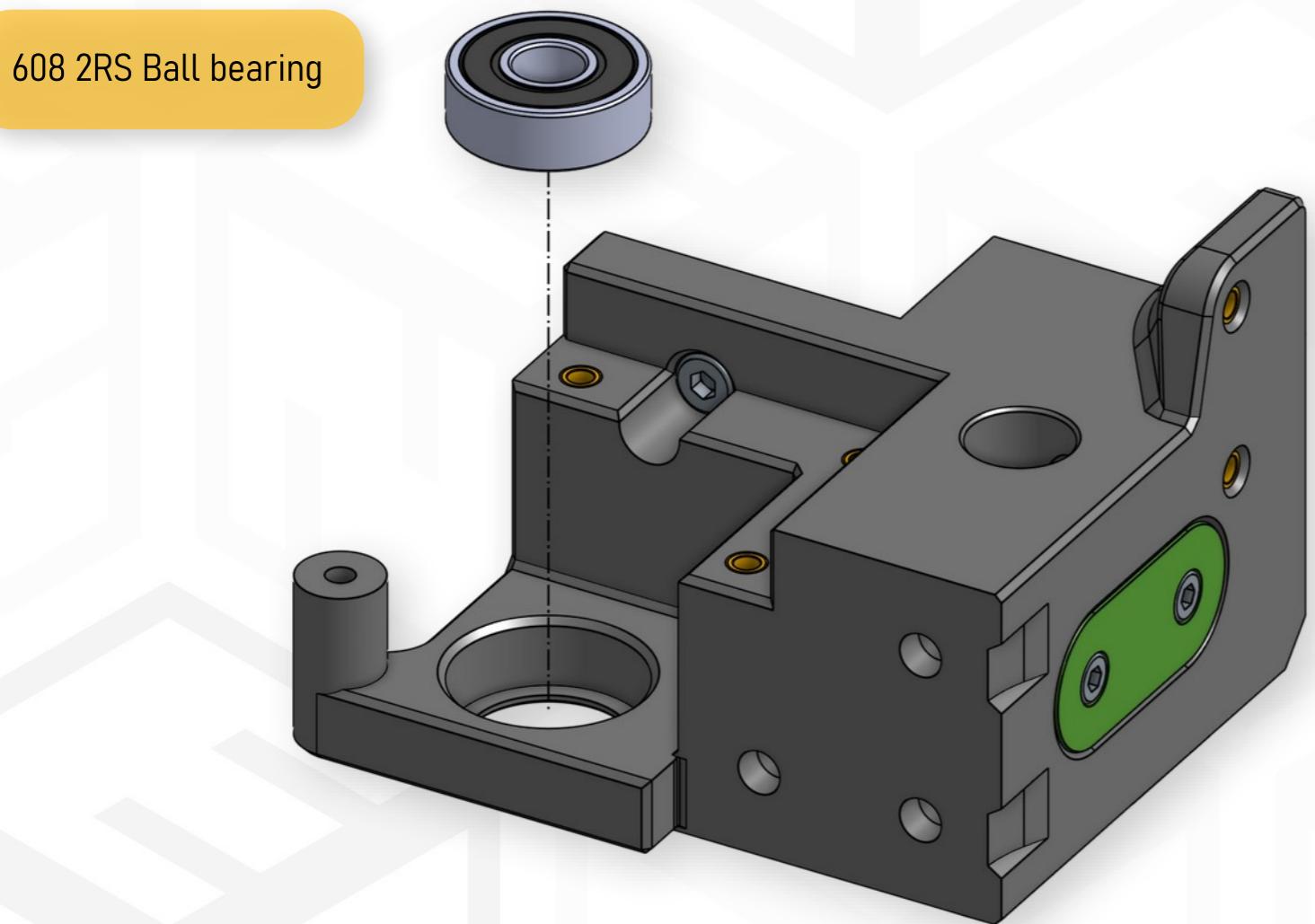
4x 608 2RS Ball bearing (= both sides)

## PRINTED PARTS:

frame\_bottom\_front\_left\_cap.stl (pictured in the build guide)  
frame\_bottom\_front\_right\_cap.stl

# BOTTOM FRAME FRONT CORNERS

## LEADScrew BEARINGS INSTALLATION



## TOOLS:

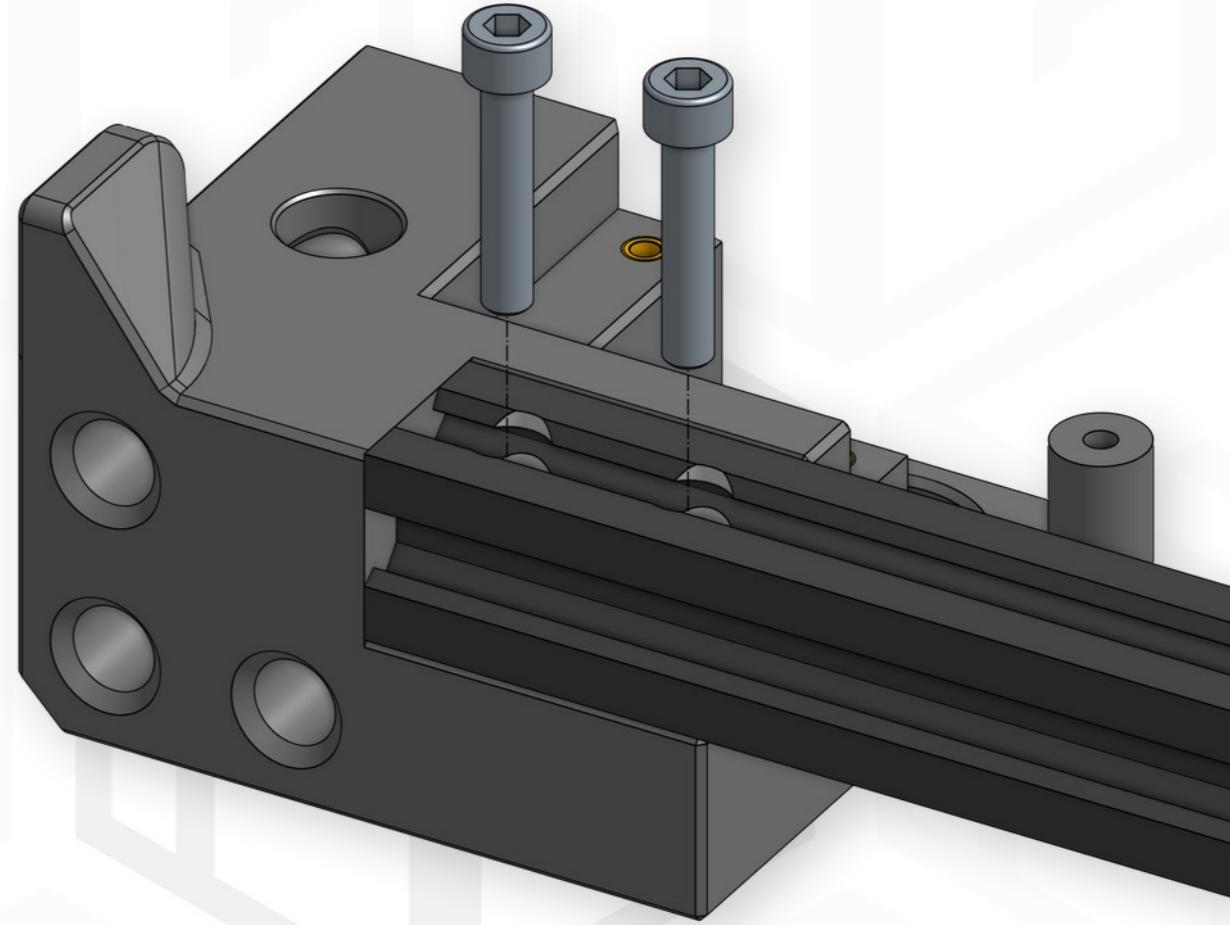
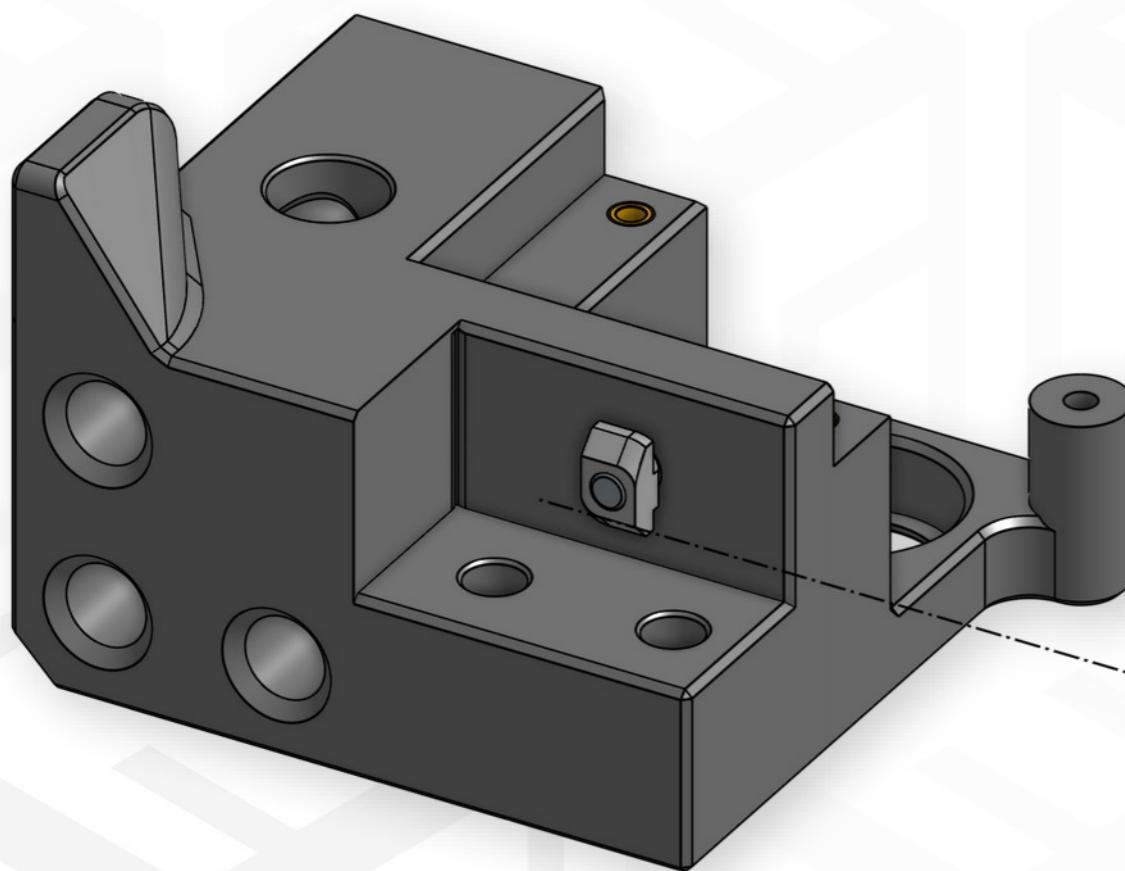
3 mm Allen key  
4 mm Allen key

## HARDWARE:

4x M5x25 SHCS (= both sides)  
1x V-Slot 2020 Extrusion 330 mm (Ender 3 top frame bar)

# BOTTOM FRAME FRONT CORNERS

## FRONT 2020 EXTRUSION INSTALLATION



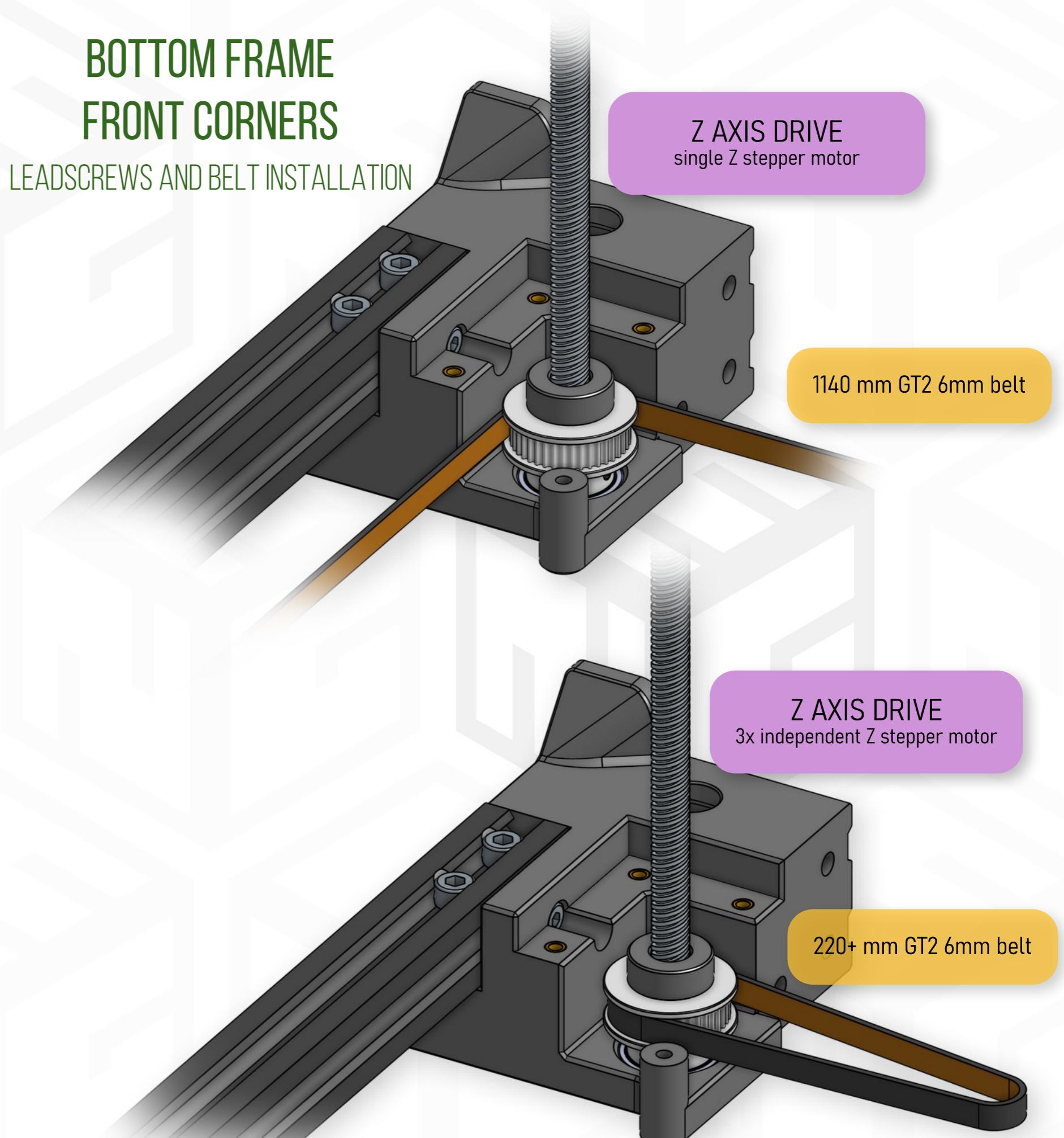
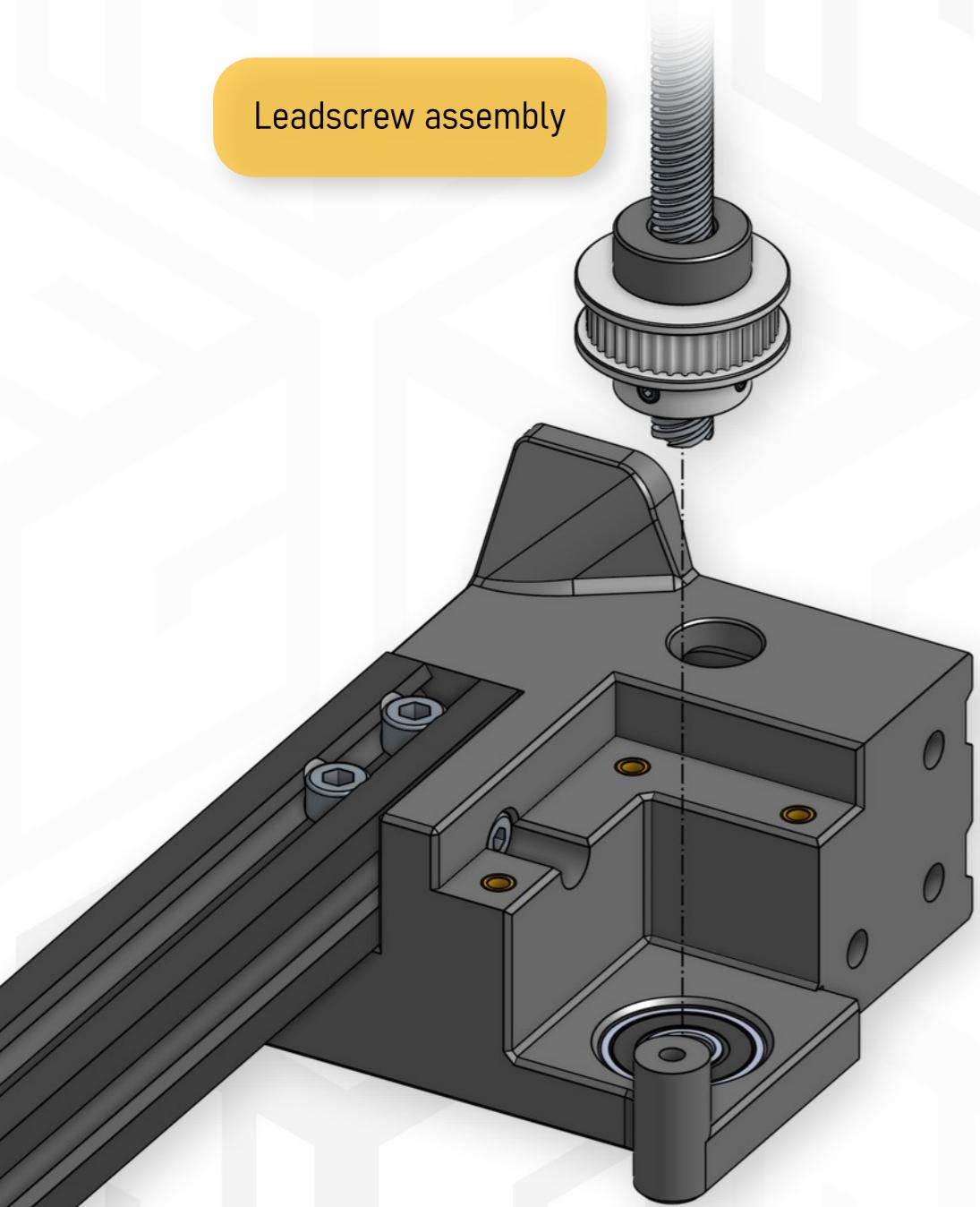
2020 x 330 mm V-Slot extrusion

## HARDWARE:

1x 1140 mm GT2 6mm closed loop belt ( 1x Z stepper motor version )  
2x 220+ mm GT2 6mm belt ( 3x Z stepper motor version )

# BOTTOM FRAME FRONT CORNERS

## LEADSCREWS AND BELT INSTALLATION



## TOOLS:

2.5 mm Allen key

## HARDWARE:

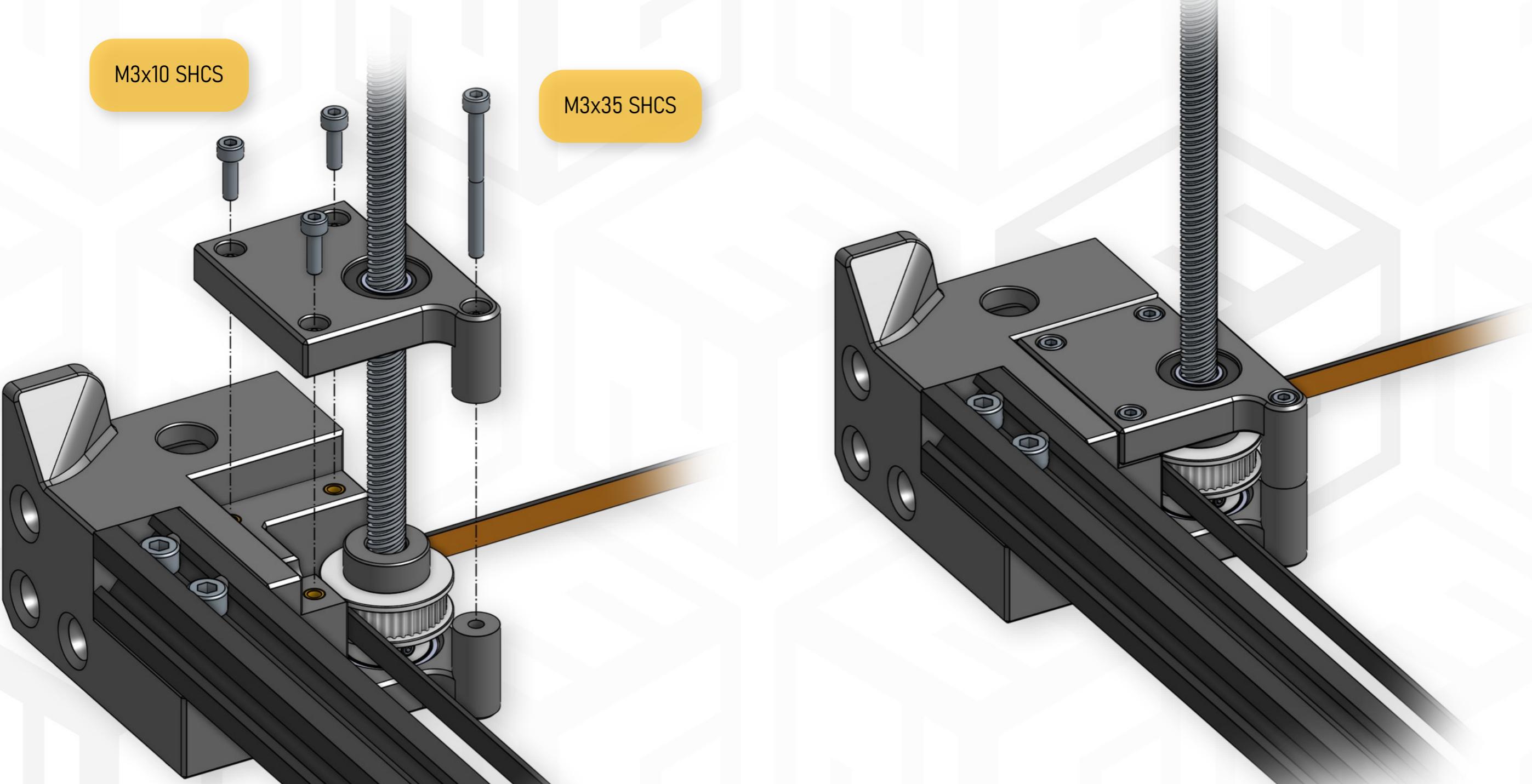
6x M3x10 SHCS (= both sides)  
2x M3x35 SHCS (= both sides)

# BOTTOM FRAME FRONT CORNERS

## LEADSCREW CAPS

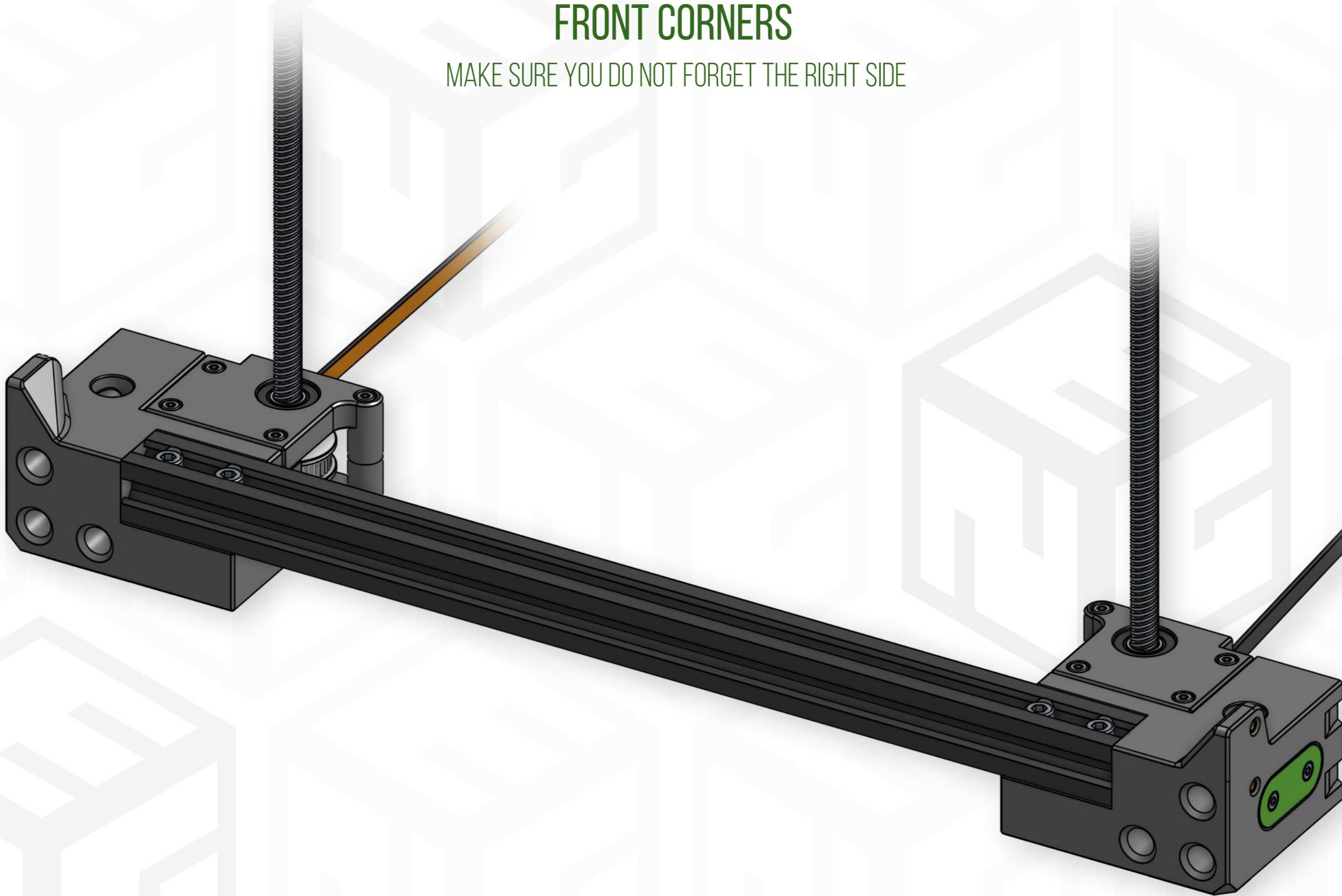
### TIP: ADJUSTMENT

The cap piece allows slight movement in the XY plane so we can adjust the leadscrew verticality later.



## BOTTOM FRAME FRONT CORNERS

MAKE SURE YOU DO NOT FORGET THE RIGHT SIDE



**TOOLS:**

Heat set insert press

**HARDWARE:**

3x M3 Heat set insert

**PRINTED PARTS:**

frame\_bottom\_front\_skirt.stl

# BOTTOM FRAME FRONT SKIRT

## INSTALLING HEAT SET INSERTS

**TIP: ENCLOSURE**

All heat inserts are used for installing the enclosure, so if you are not going to enclose the printer, you can choose not to install them.



TOOLS:

2.5 mm Allen key

HARDWARE:

4x M3x8 SHCS

4x M3 T-Nut

# BOTTOM FRAME FRONT SKIRT

## INSTALLING SCREWS AND T-NUTS

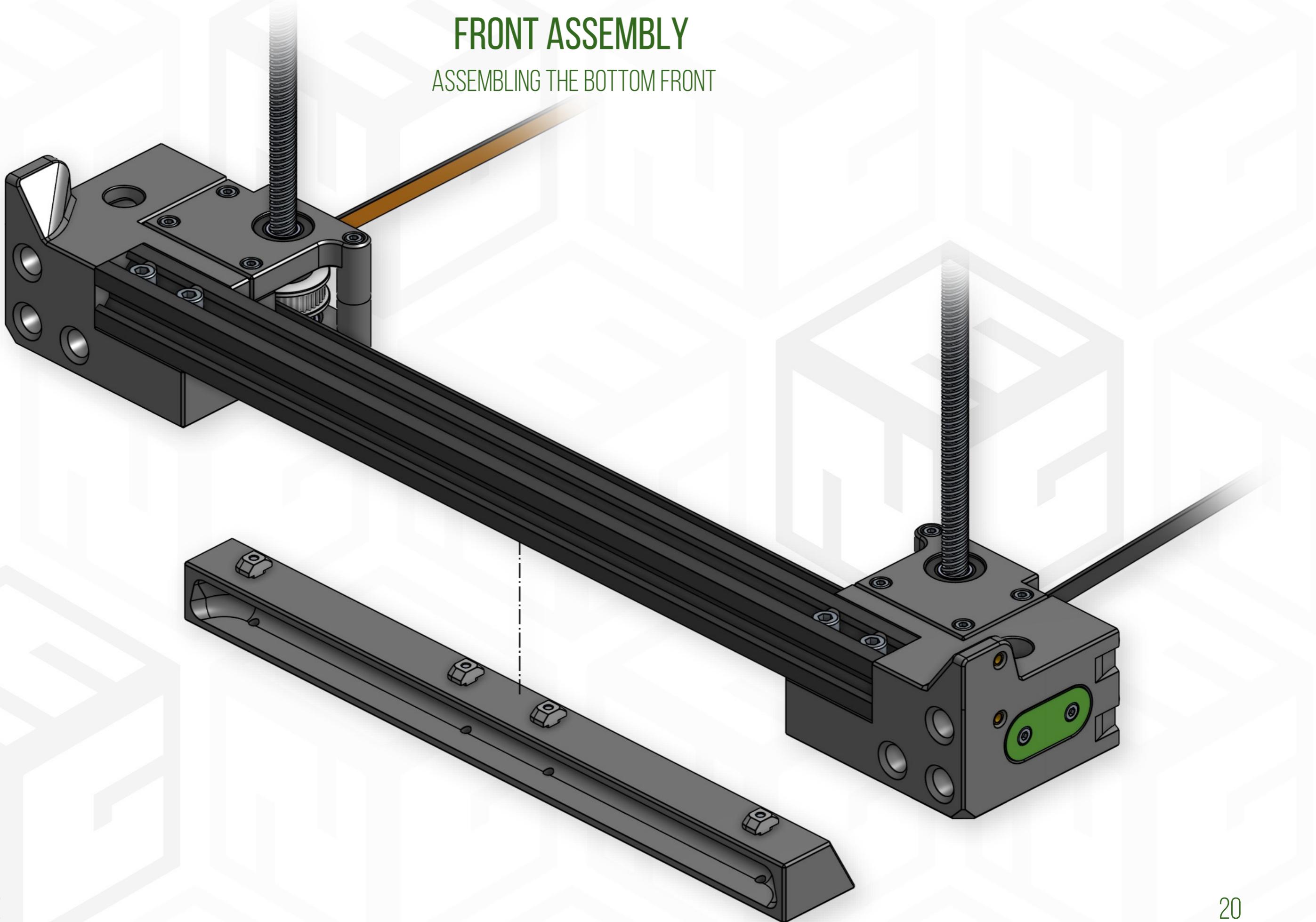


TOOLS:

2.5 mm Allen key

## BOTTOM FRAME FRONT ASSEMBLY

ASSEMBLING THE BOTTOM FRONT



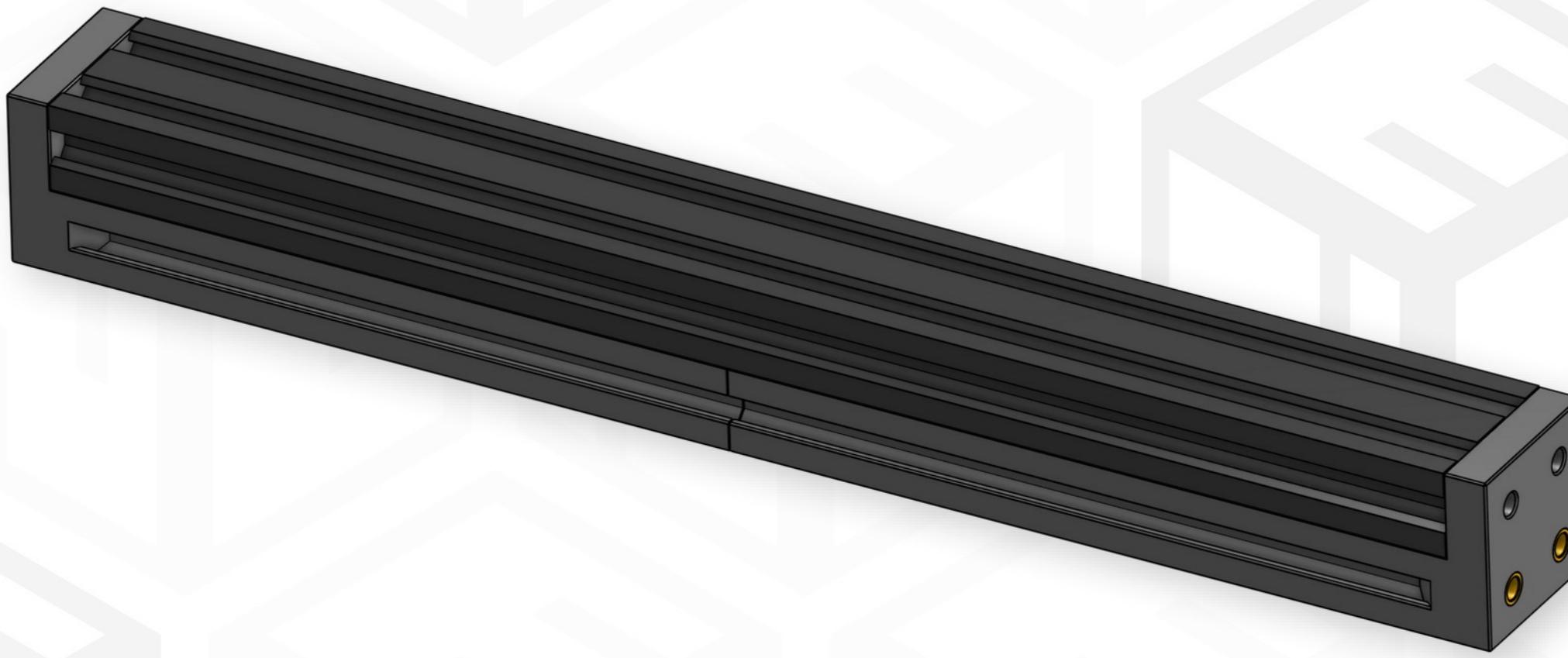
## BOTTOM FRAME FRONT ASSEMBLY



BASE PRINTER: ENDER 3

## BOTTOM FRAME REAR EXTRUSION

ENDER 3



BASE PRINTER: ENDER 3

TOOLS:

2.5 mm Allen key

HARDWARE:

3x M3 Heat set insert  
4x M5 Heat set insert

4x M3x8 SHCS

4x M3 T-Nut

1x V-Slot 2040 Extrusion 330 mm ( Ender 3 Y-axis )

PRINTED PARTS:

frame\_bottom\_E3\_fix\_left.stl  
frame\_bottom\_E3\_fix\_right.stl

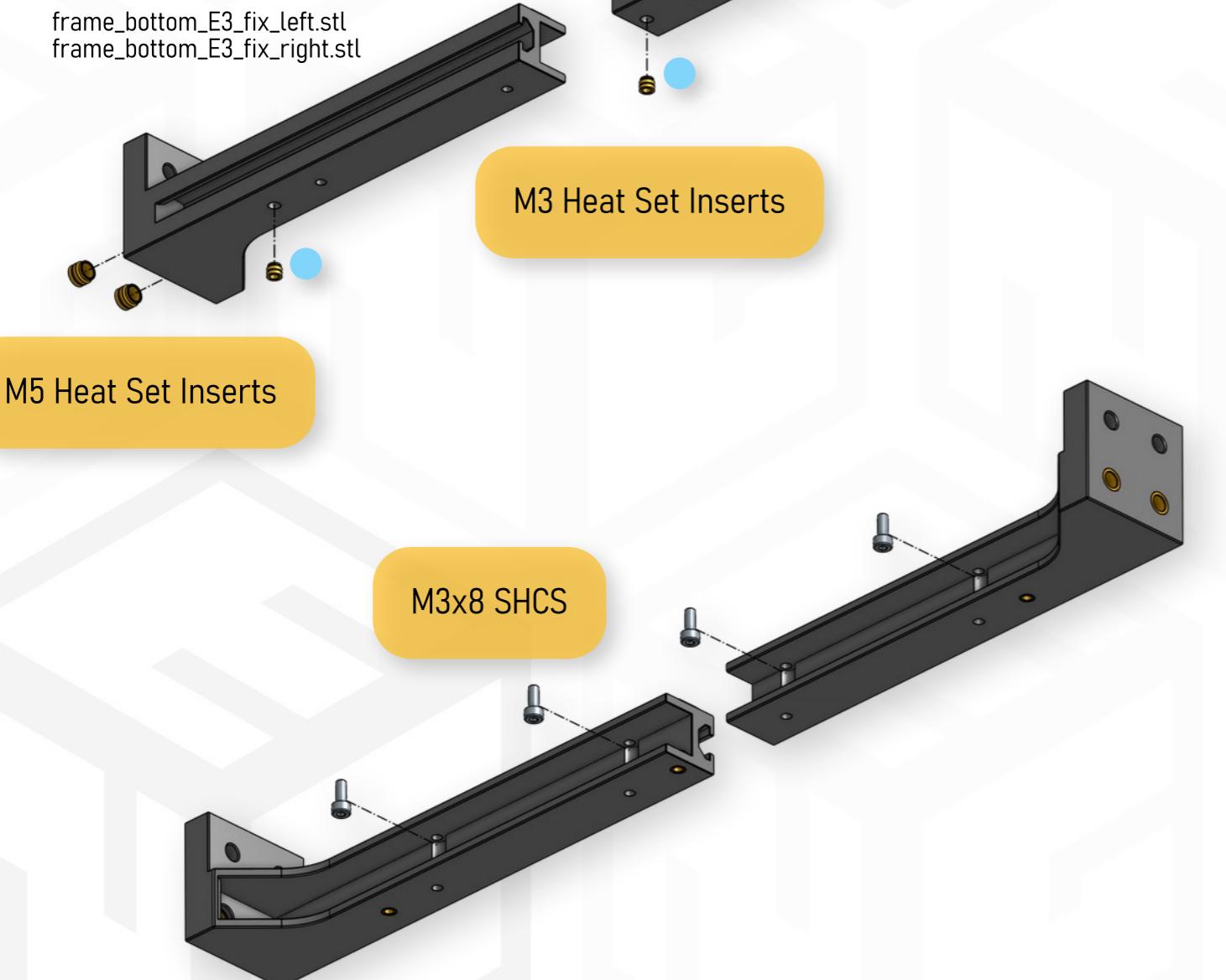
# BOTTOM FRAME REAR EXTRUSION

ENDER 3

M5 Heat Set Inserts

M3 T-Nuts

2040 x 330 mm V-Slot Extrusion



TIP: ENCLOSURE  
Three marked M3 heat set inserts are used for installing the enclosure, so if you are not going to enclose the printer, you can choose not to install them.

BASE PRINTER: ENDER 3 V2

# BOTTOM FRAME REAR EXTRUSION

ENDER 3 V2

## TOOLS:

Tape measure / ruler

## HARDWARE:

1x V-Slot 4040 Extrusion 343 mm ( Ender 3 V2 )

## PRINTED PARTS:

2x frame\_optional\_4040\_spacer\_10mm.stl

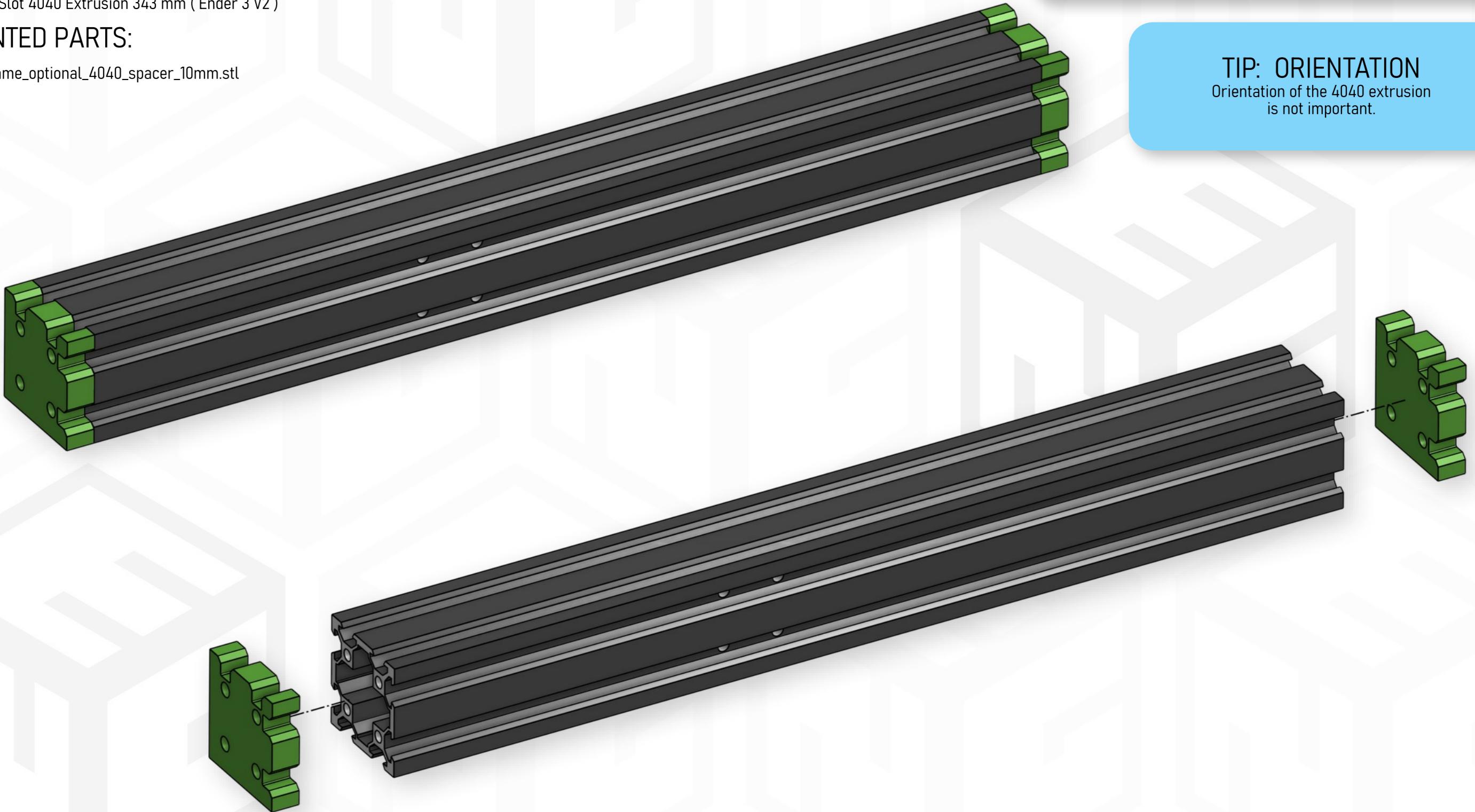
## WARNING: EXTRUSION LENGTH

We need to adapt the length of our 4040 extrusion to be 350mm.  
Measure the length of your extrusion (Le) and based on that,  
adjust the 4040 spacers Z dimension (Zs) accordingly in the slicer.

$$Zs = (350 - Le) / 2$$

Most Ender 3 V2 have 343 mm long extrusion which would  
result in 2x 3.5 mm spacer.

**TIP: ORIENTATION**  
Orientation of the 4040 extrusion  
is not important.



## TOOLS:

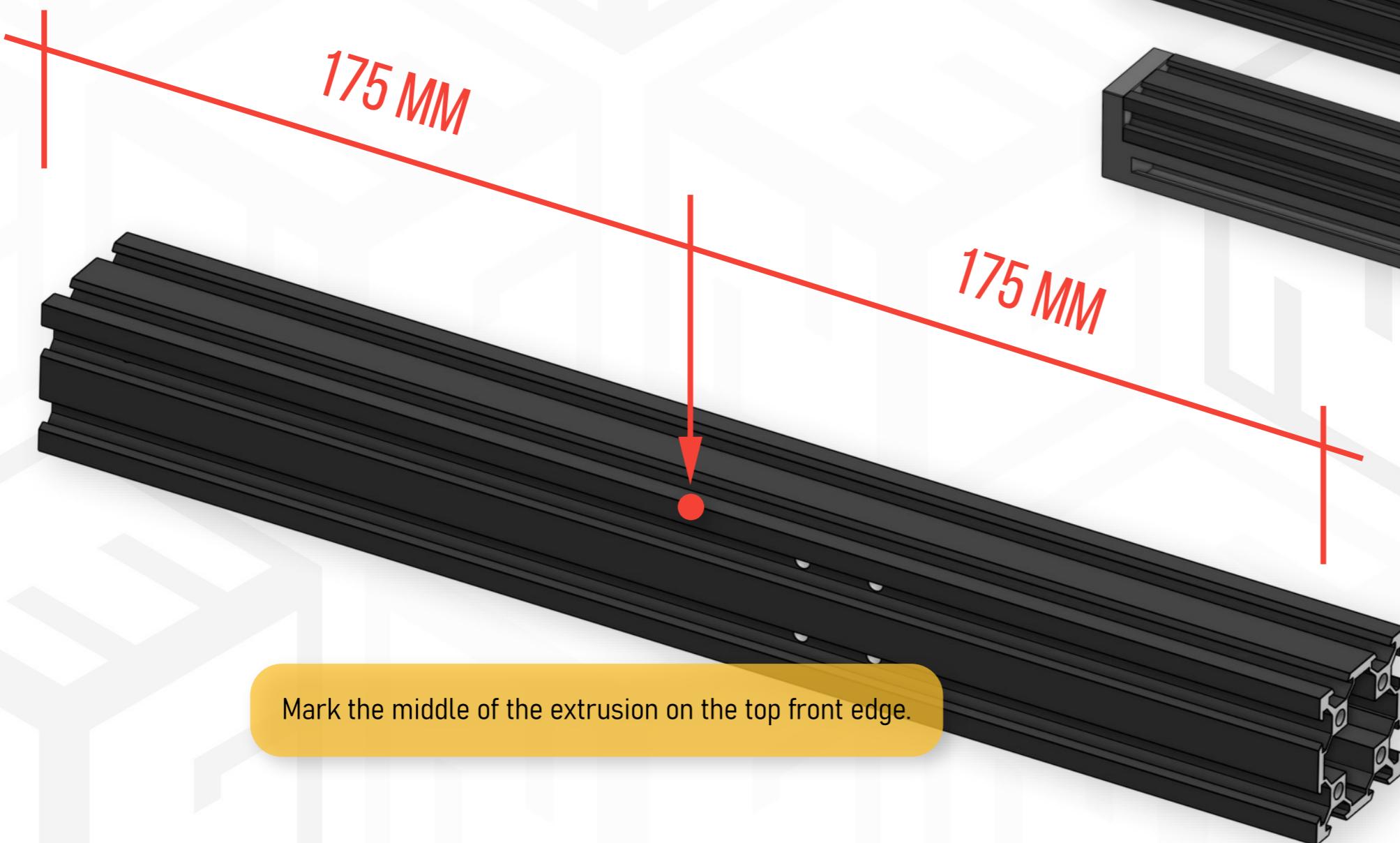
Tape measure / ruler  
Marker ( masking tape to keep the extrusion clean )

## HARDWARE:

- 1x V-Slot 4040 Extrusion 350 mm ( Ender 3 pro Y-axis )  
Or your adapted version if you are not using Ender 3 Pro

# BOTTOM FRAME REAR EXTRUSION

## PREPARATION



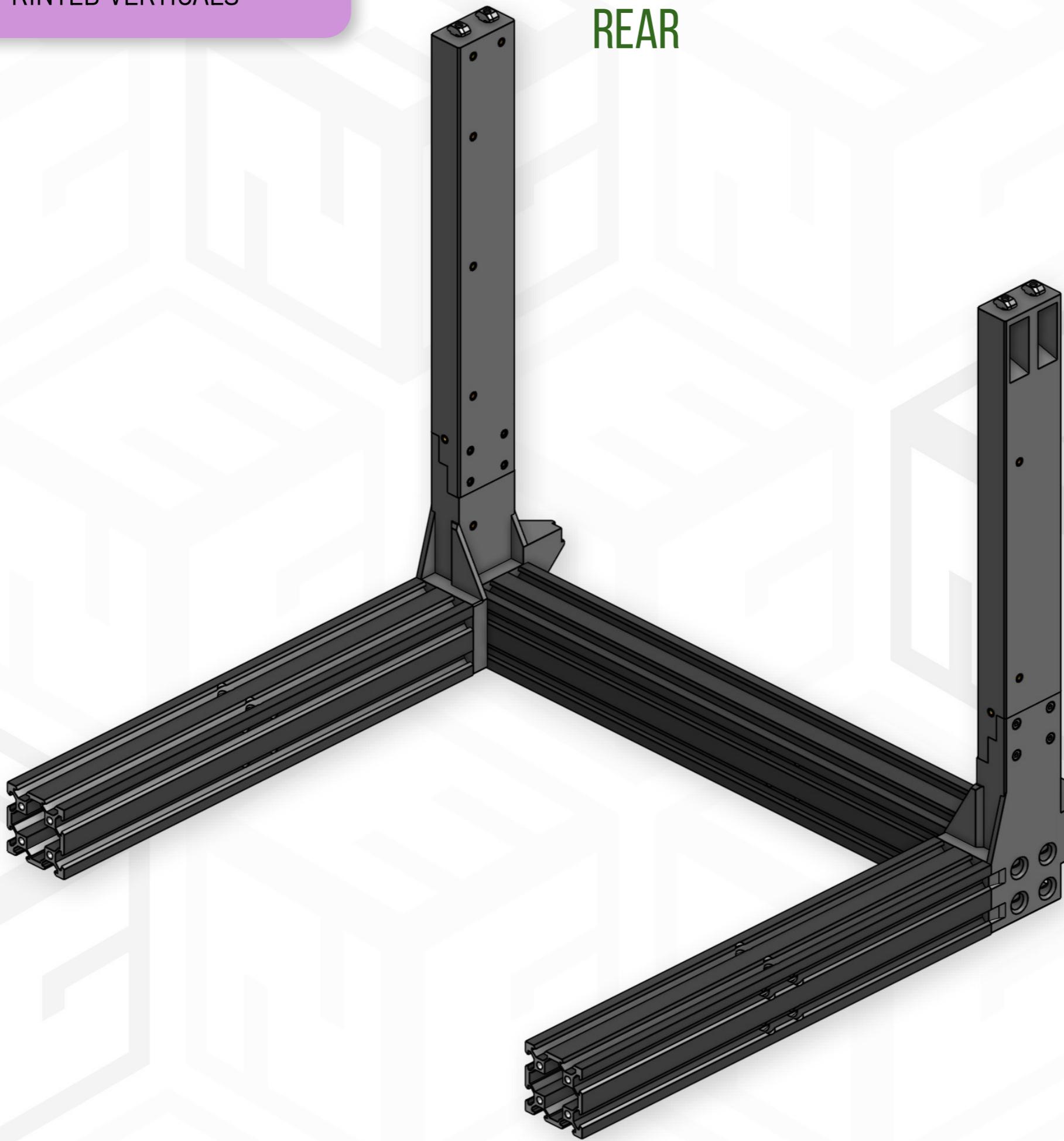
**WARNING: ORIENTATION**  
Orientation of the E3 or E3V2 adapted extrusion  
is important!

**TIP: ORIENTATION**  
Orientation of the 4040 x 350mm extrusion  
is not important.



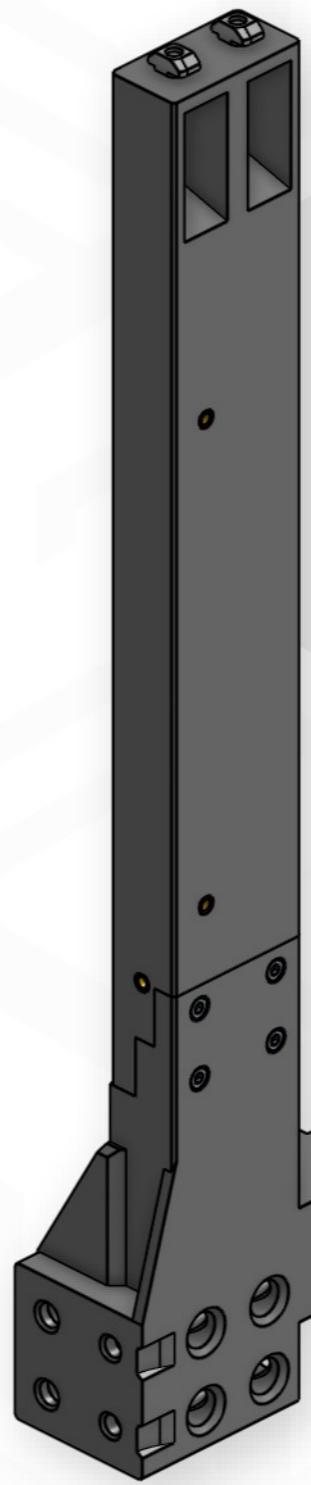
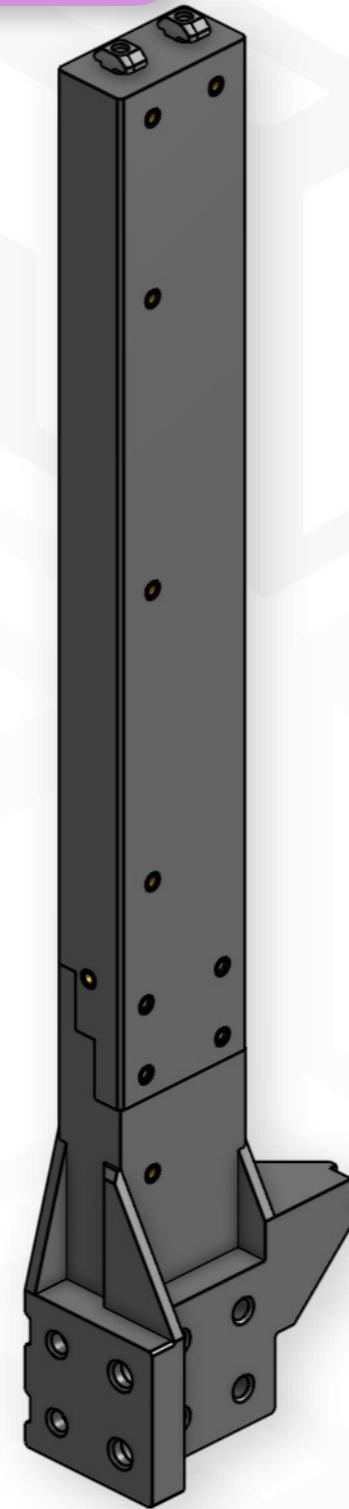
FRAME: PRINTED VERTICALS

BOTTOM FRAME  
REAR



FRAME: PRINTED VERTICALS

## BOTTOM FRAME REAR CORNERS



FRAME: PRINTED VERTICALS

## BOTTOM FRAME REAR CORNERS

### INSTALLING HEAT SET INSERTS

#### TOOLS:

Heat set insert press

#### HARDWARE:

4x M3 Heat set insert ( = both sides )  
2x M5 Heat set insert ( = both sides )

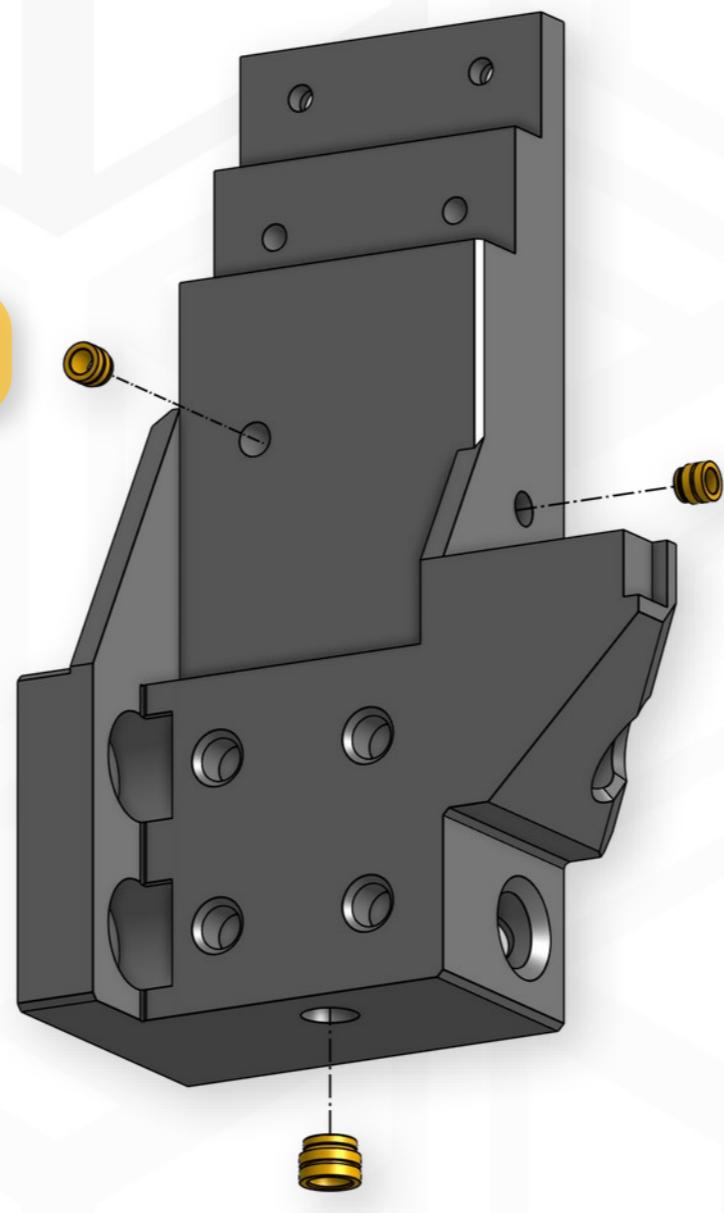
#### PRINTED PARTS:

frame\_bottom\_rear\_left\_body.stl ( pictured in the build guide )  
frame\_bottom\_rear\_right\_body.stl

#### NOTE: SYMMETRY

Left and right front corners are symmetrical, therefore only one side is shown in the build guide.

Repeat the process in the entire "REAR CORNERS" section for the other side.



FRAME: PRINTED VERTICALS

## BOTTOM FRAME REAR CORNERS PRINTED

TOOLS:

Heat set insert press

HARDWARE:

28x M3 Heat set insert (= both sides)

PRINTED PARTS:

frame\_bottom\_rear\_left\_vertical.stl (in the build guide)  
frame\_bottom\_rear\_right\_vertical.stl

M3 Heat Set Inserts

M3 Heat Set Inserts

M3 Heat Set Insert

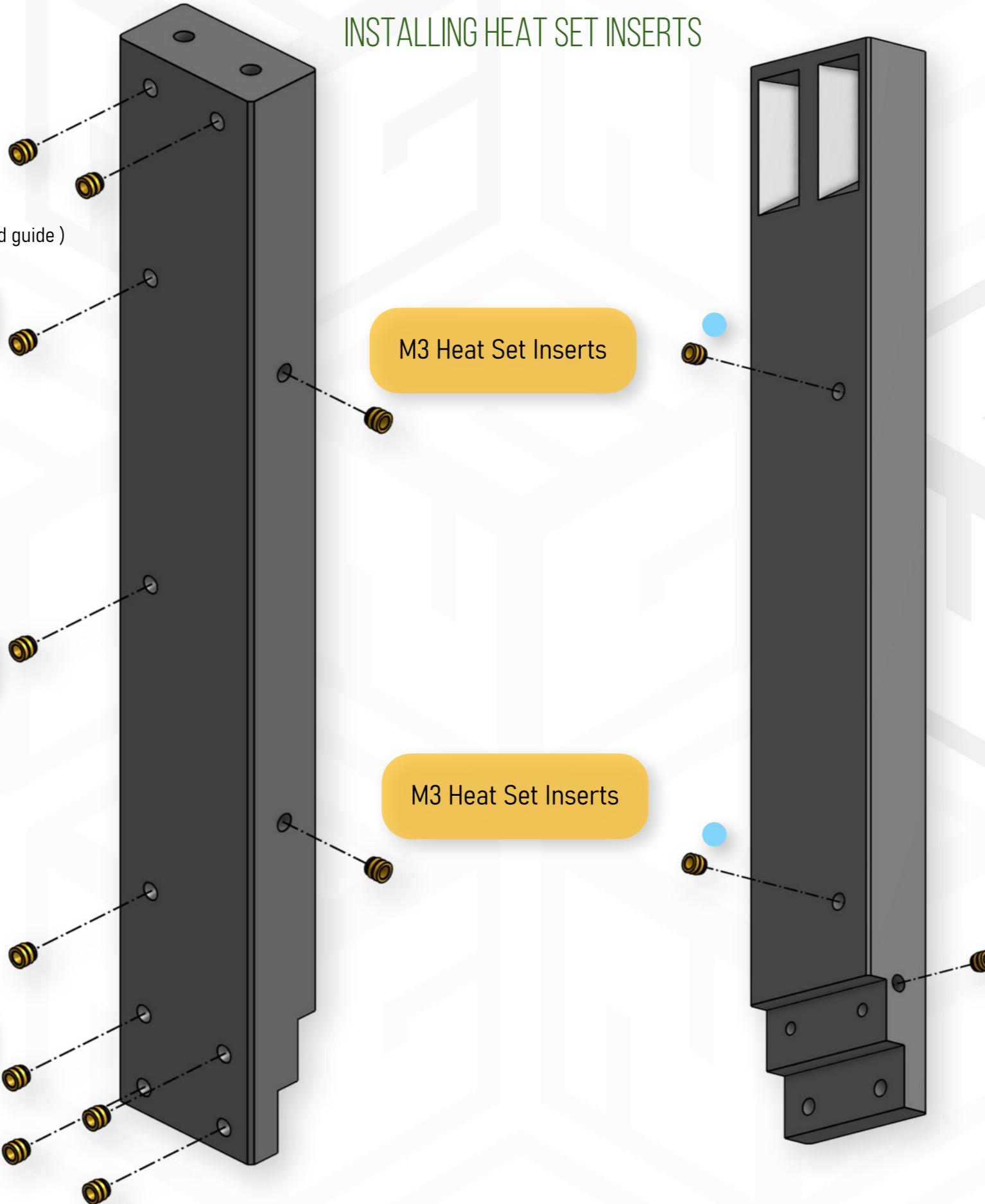
M3 Heat Set Inserts

M3 Heat Set Inserts

TIP: ENCLOSURE

Two marked heat inserts are used for installing the enclosure, so if you are not going to enclose the printer, you can choose not to install them.

INSTALLING HEAT SET INSERTS



FRAME: PRINTED VERTICALS

## BOTTOM FRAME REAR CORNERS PRINTED

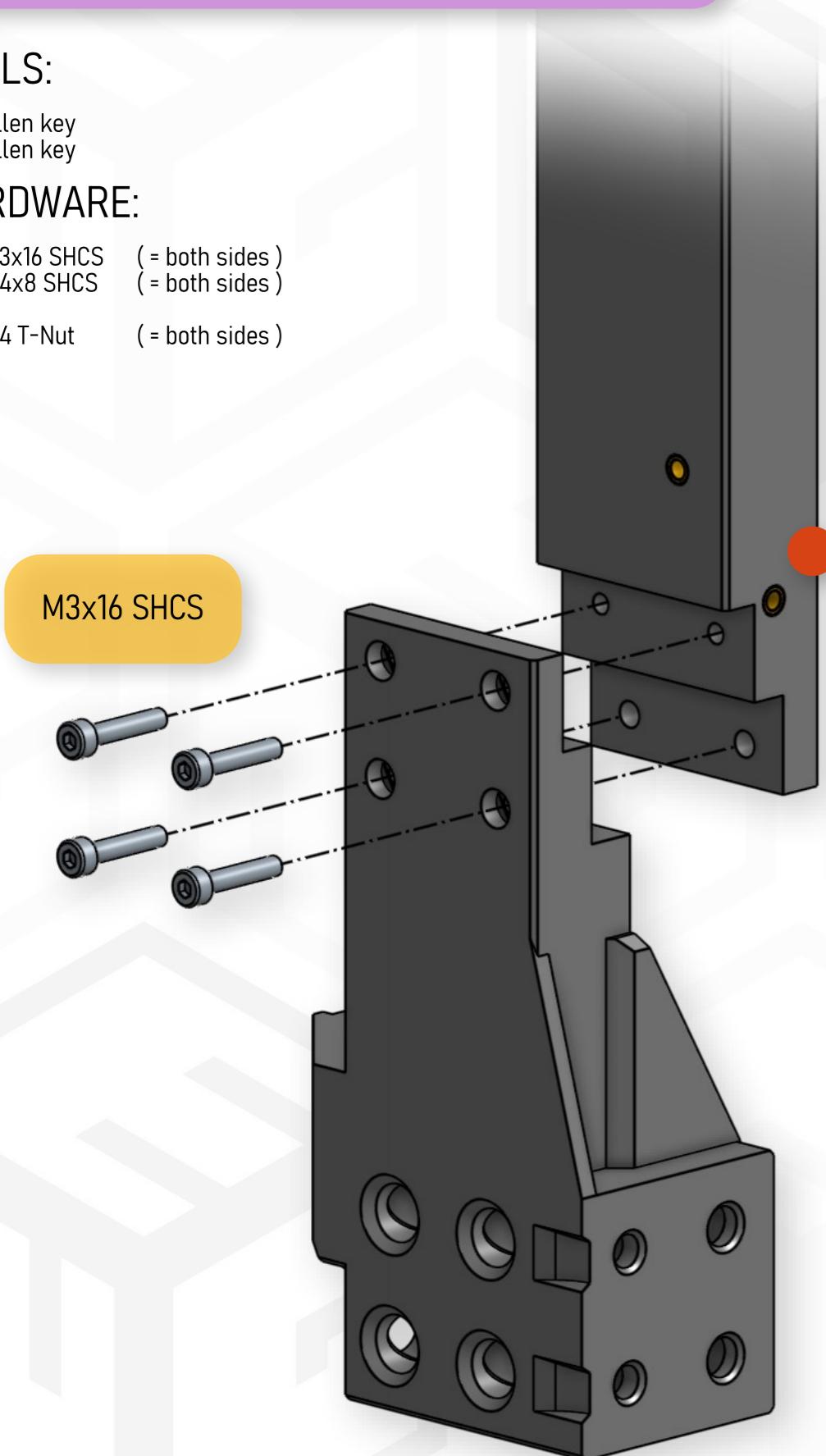
### PARTS ASSEMBLY

#### TOOLS:

2.5 mm Allen key  
3 mm Allen key

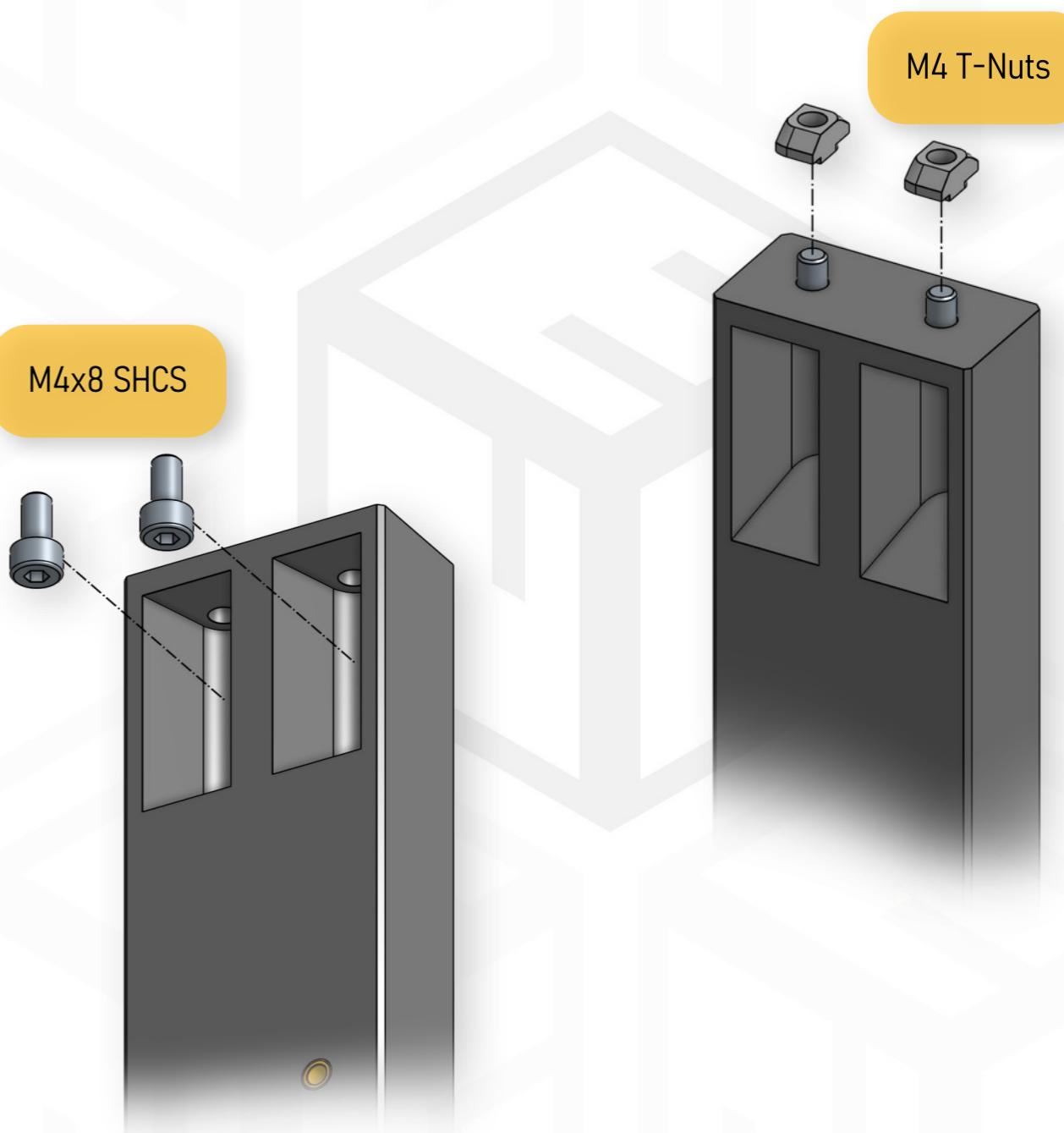
#### HARDWARE:

8x M3x16 SHCS (= both sides)  
4x M4x8 SHCS (= both sides)  
4x M4 T-Nut (= both sides)



**WARNING: MATCHING SIDES**  
Left and right verticals are interchangeable!

Keep note of the heat inserts on their sides.  
The lower M3 heat insert (marked in the picture)  
must be matching the position as shown here.



FRAME: PRINTED VERTICALS

TOOLS:

4 mm Allen key

HARDWARE:

8x M5x12 SHCS (= both sides)

2x V-Slot 4040 Extrusion 290 mm (Ender 3 bottom frame sides)

## BOTTOM FRAME SIDES

NOTE: SYMMETRY

Left and right sides are symmetrical,  
therefore only one is shown here.

Repeat this process for the other side.

TIP: FLAT SURFACE

When screwing parts together, lay them on their  
side on a true flat surface to ensure they are  
not twisted.

PS orientation of the 4040 extrusion  
is not important.

4040 x 290 mm V-Slot Extrusion

M5x12 SHCS

FRAME: PRINTED VERTICALS

## BOTTOM FRAME REAR

TOOLS:

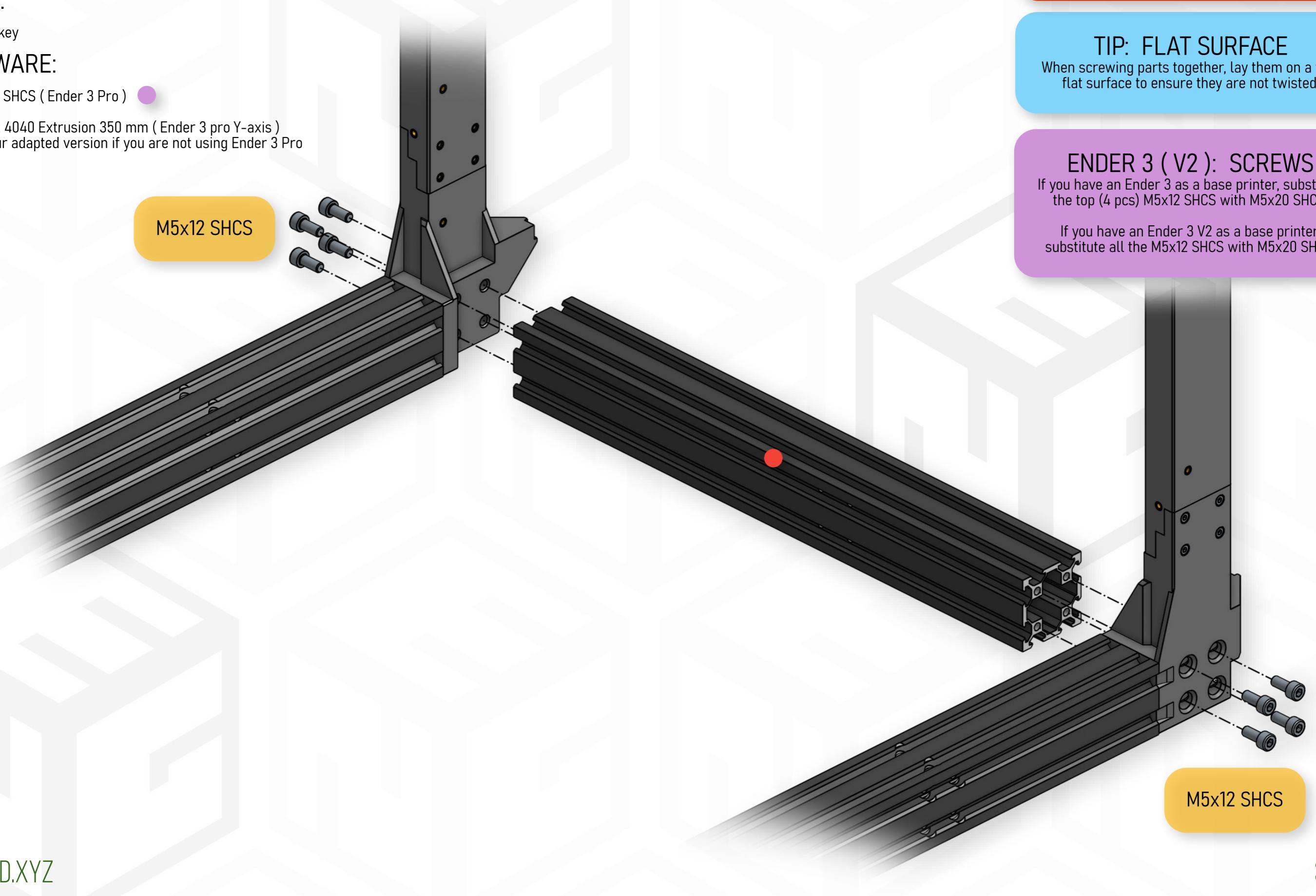
4 mm Allen key

HARDWARE:

8x M5x12 SHCS ( Ender 3 Pro )

1x V-Slot 4040 Extrusion 350 mm ( Ender 3 pro Y-axis )  
Or your adapted version if you are not using Ender 3 Pro

M5x12 SHCS



**WARNING: ORIENTATION**

Keep the orientation of the 4040 extrusion with previously marked middle point as shown.

**TIP: FLAT SURFACE**

When screwing parts together, lay them on a true flat surface to ensure they are not twisted.

**ENDER 3 ( V2 ): SCREWS**

If you have an Ender 3 as a base printer, substitute the top (4 pcs) M5x12 SHCS with M5x20 SHCS.

If you have an Ender 3 V2 as a base printer, substitute all the M5x12 SHCS with M5x20 SHCS.

M5x12 SHCS

FRAME: 2040 UPGRADE + ULTIMATE

## BOTTOM FRAME REAR



## FRAME: 2040 UPGRADE + ULTIMATE

# BOTTOM FRAME SIDES

## TOOLS:

3 mm Allen key  
4 mm Allen key

## HARDWARE:

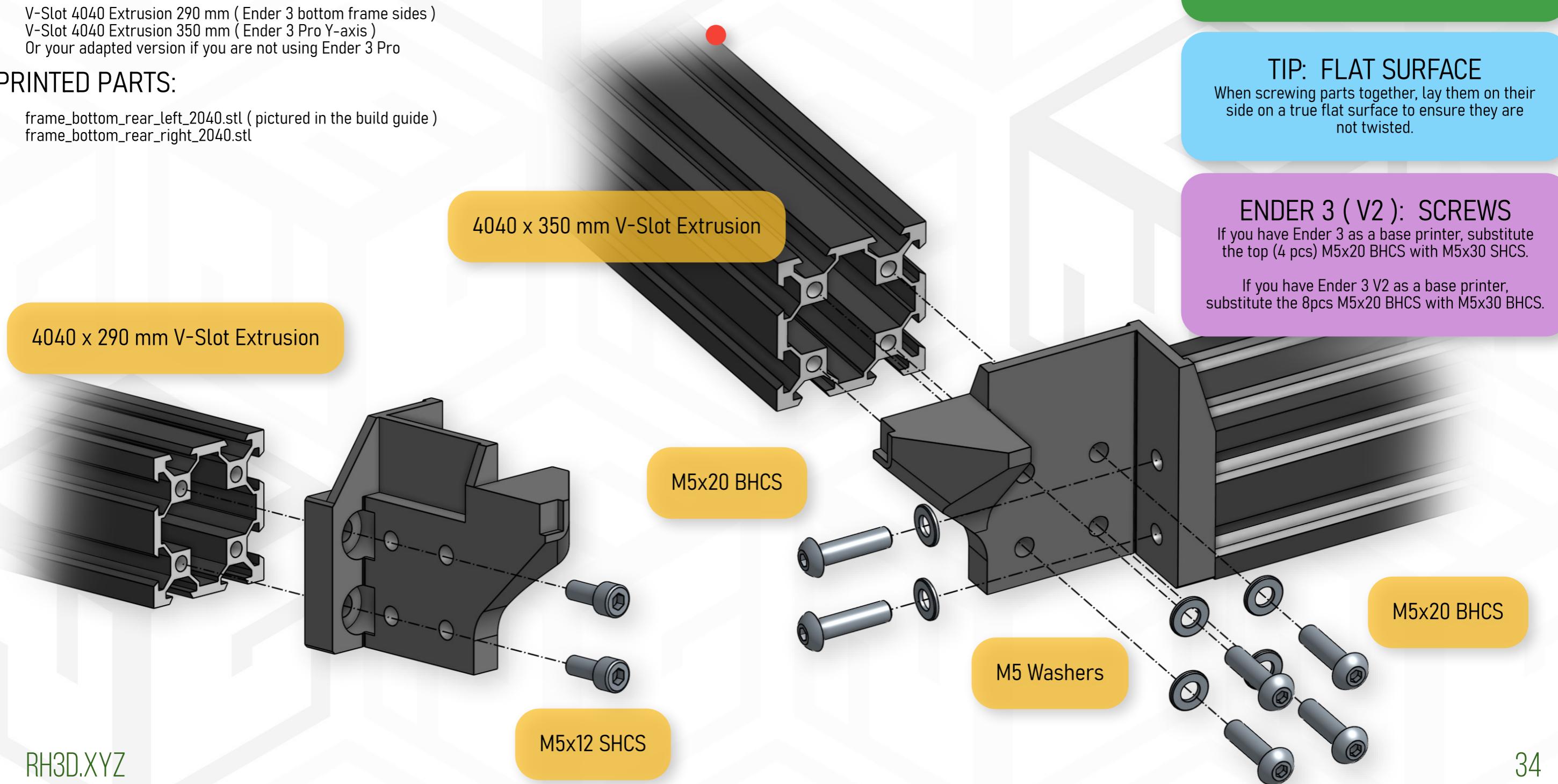
4x M5x12 SHCS (= both sides)  
12x M5x20 BHCS (= both sides)

12x M5 Washer (= both sides)

2x V-Slot 4040 Extrusion 290 mm (Ender 3 bottom frame sides)  
1x V-Slot 4040 Extrusion 350 mm (Ender 3 Pro Y-axis)  
Or your adapted version if you are not using Ender 3 Pro

## PRINTED PARTS:

frame\_bottom\_rear\_left\_2040.stl (pictured in the build guide)  
frame\_bottom\_rear\_right\_2040.stl



## WARNING: ORIENTATION

Keep orientation of the rear 4040 extrusion with previously marked middle point as shown.

For ultimate frame, keep orientation of side 4040 extrusions so the blind joint holes will be at the front and in the outer V-Slot.

## NOTE: SYMMETRY

Left and right sides are symmetrical, therefore only one is shown here.

Repeat this process for the other side.

## TIP: FLAT SURFACE

When screwing parts together, lay them on their side on a true flat surface to ensure they are not twisted.

## ENDER 3 (V2): SCREWS

If you have Ender 3 as a base printer, substitute the top (4 pcs) M5x20 BHCS with M5x30 SHCS.

If you have Ender 3 V2 as a base printer, substitute the 8pcs M5x20 BHCS with M5x30 BHCS.

FRAME: 2040 UPGRADE + ULTIMATE

TOOLS:

3 mm Allen key

HARDWARE:

2x V-Slot 2040 Extrusion 350 mm (= both sides)

# BOTTOM FRAME SIDES

## NOTE: SYMMETRY

Left and right sides are symmetrical, therefore only one is shown here.

Repeat this process for the other side.

## TIP: FLAT SURFACE

When screwing parts together, lay them on their side on a true flat surface to ensure they are not twisted.

2040 x 350 mm V-Slot Extrusion

Slide the vertical extrusion in and align the bottom to sit flat before tightening.

FRAME: ULTIMATE

BOTTOM FRAME  
REAR



## FRAME: ULTIMATE

### TOOLS:

3 mm Allen key

### HARDWARE:

4x M5x10 BHCS (= both sides)

4x M5 Washer (= both sides)

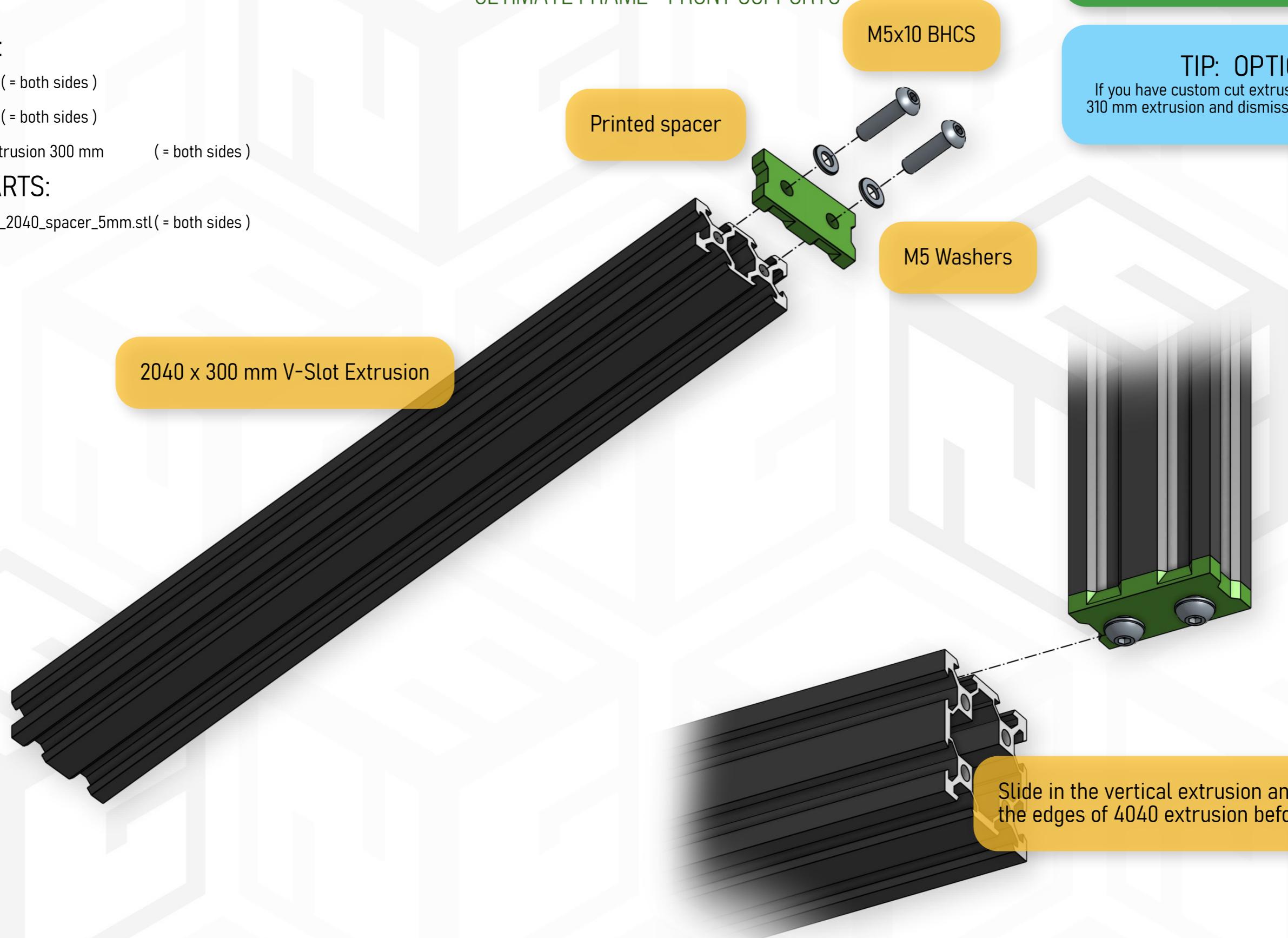
2x V-Slot 2040 Extrusion 300 mm (= both sides)

### PRINTED PARTS:

2x frame\_optional\_2040\_spacer\_5mm.stl (= both sides)

## BOTTOM FRAME SIDES

### ULTIMATE FRAME - FRONT SUPPORTS



### NOTE: SYMMETRY

Left and right sides are symmetrical, therefore only one is shown here.

Repeat this process for the other side.

### TIP: OPTIONS

If you have custom cut extrusions, you can use a 310 mm extrusion and dismiss the printed spacers.

# BOTTOM FRAME ASSEMBLY



## FRAME OPTIONS

Following chapter shows the build process for the 2040 upgrade frame option but it is the same for all the other options.

TOOLS:

4 mm Allen key

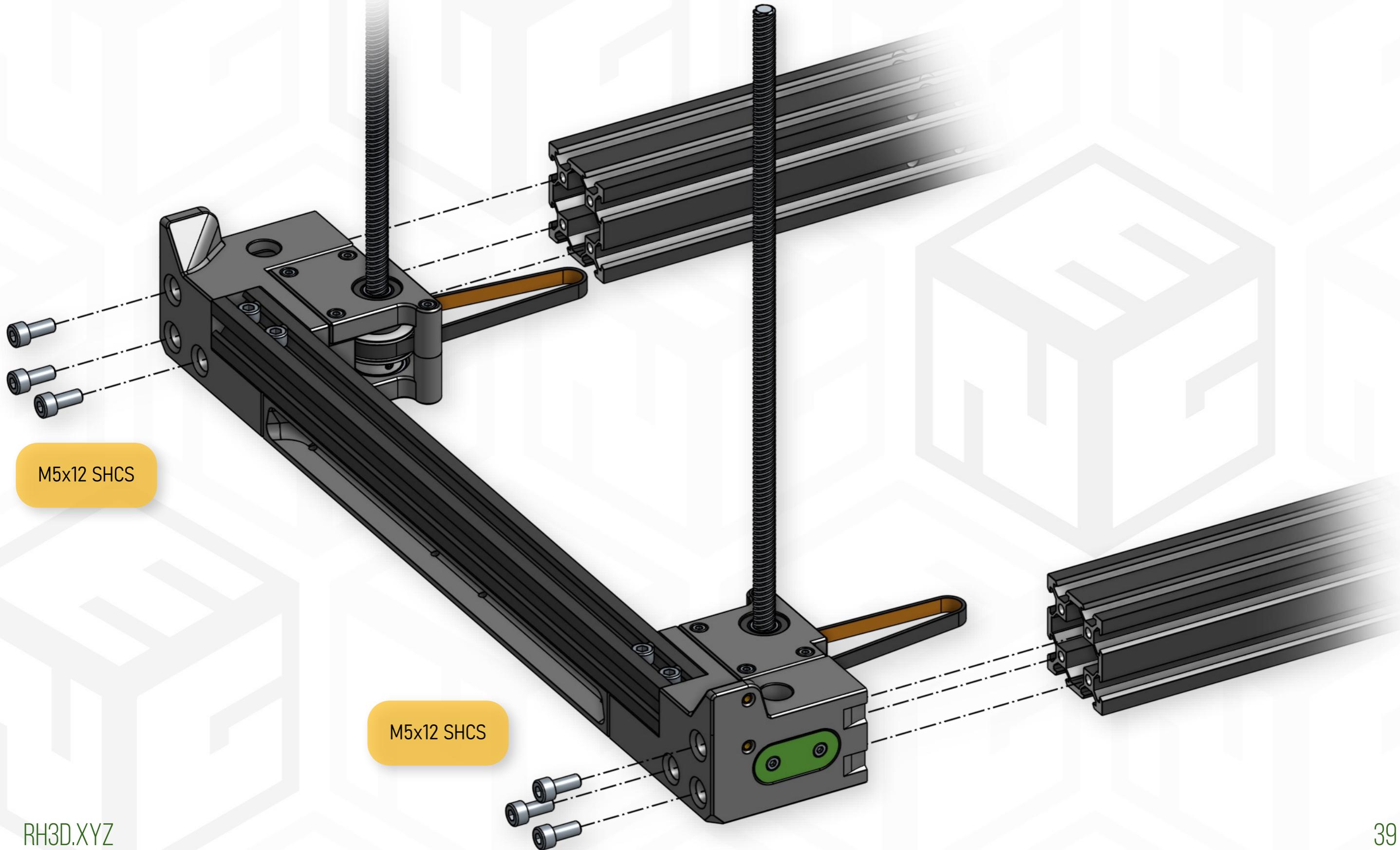
HARDWARE:

6x M5x12 SHCS

# BOTTOM FRAME FRONT

TIP: FLAT SURFACE

When screwing frame together, lay it on a true flat surface to achieve the best results and to avoid twisted frame.



## TOOLS:

4 mm Allen key

## HARDWARE:

4x M5x12 SHCS (= both sides)  
4x M5 Washer (= both sides)

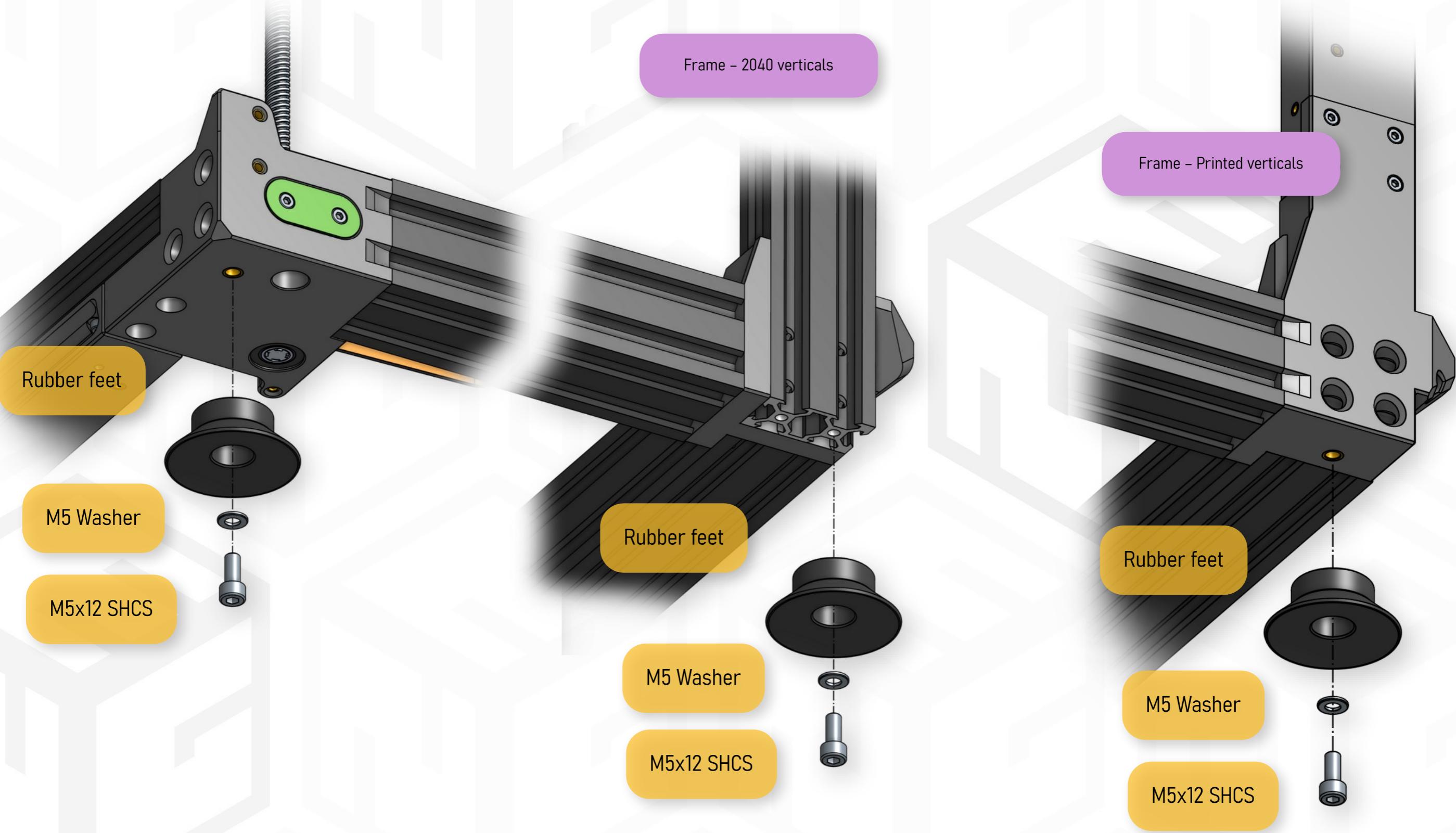
4x Rubber feet (= both sides)

# BOTTOM FRAME SIDES

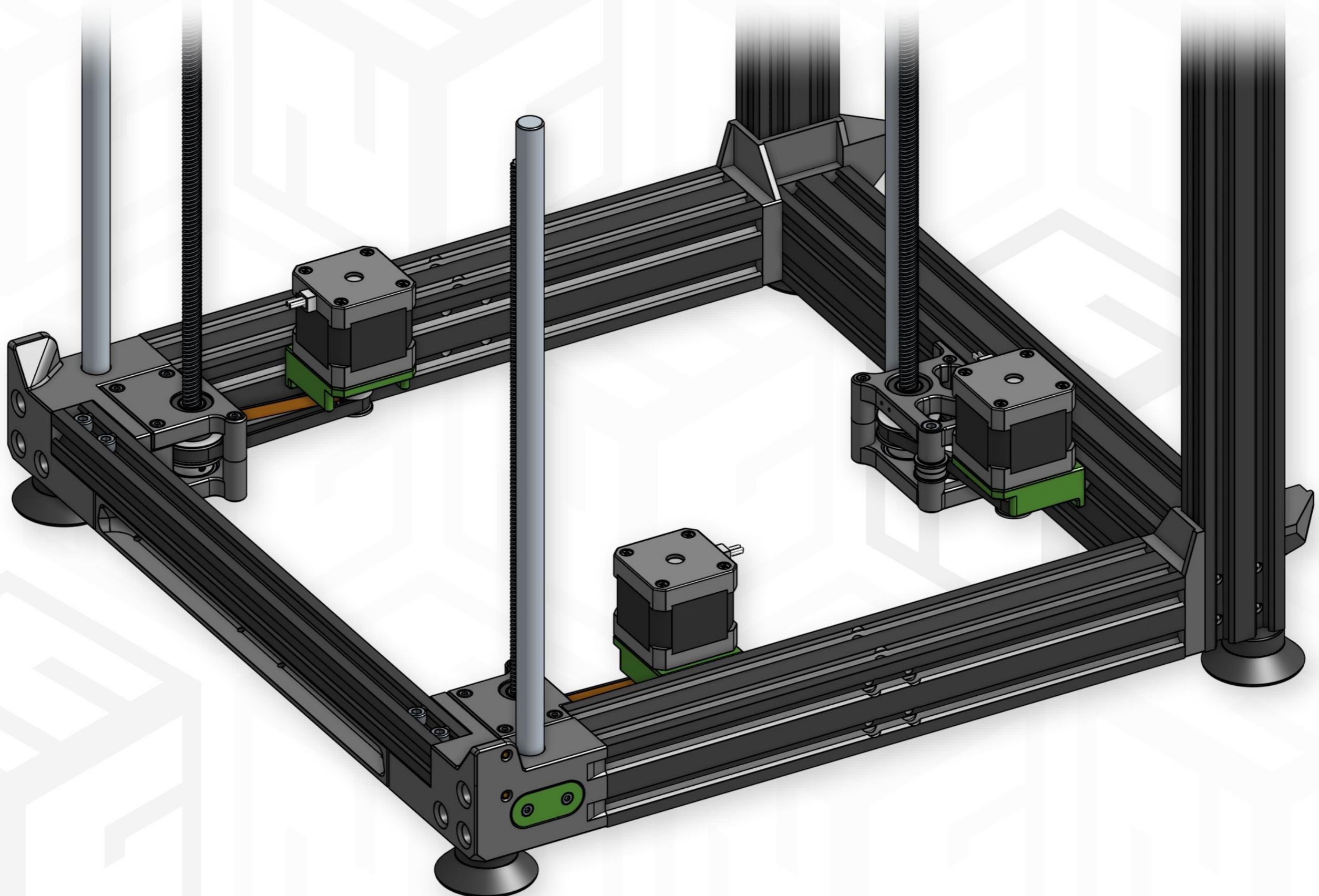
## RUBBER FEET

**NOTE: SYMMETRY**  
Left and right sides are symmetrical,  
therefore only one is shown here.

Repeat this process for the other side.

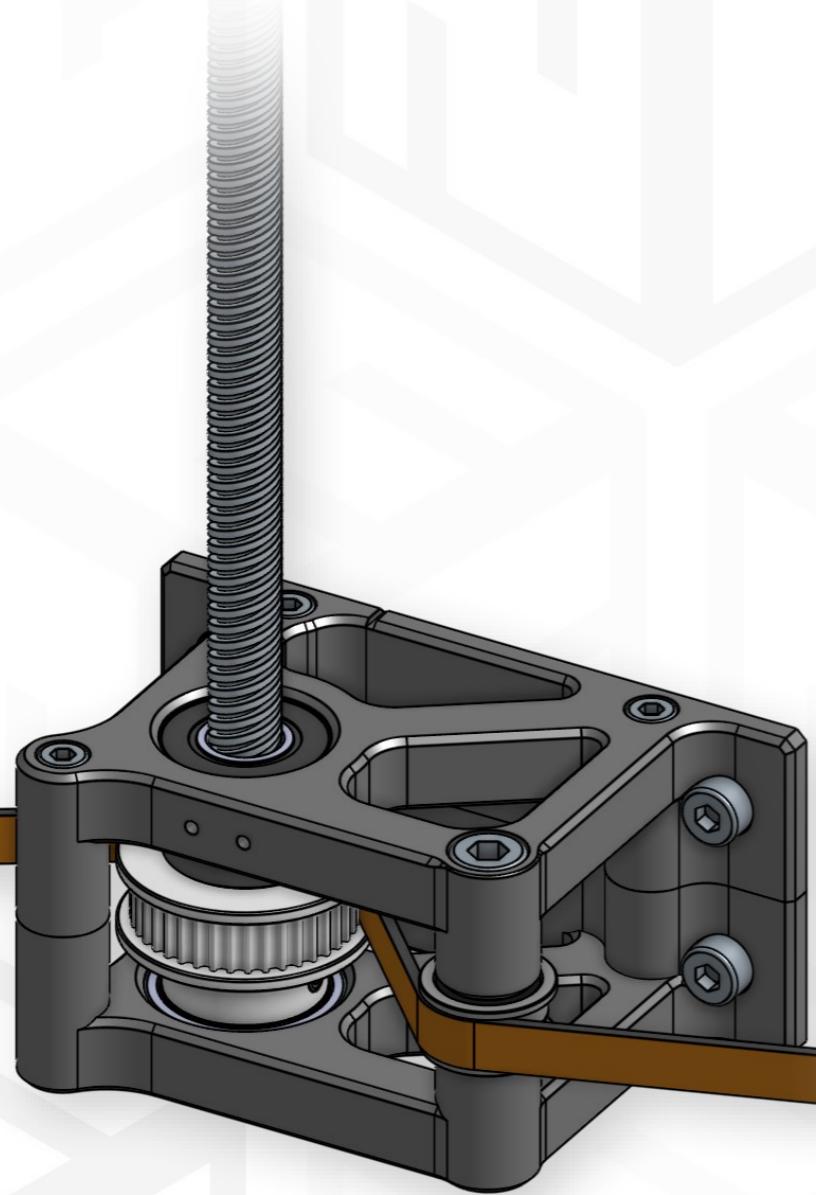


## BOTTOM FRAME Z AXIS DRIVE

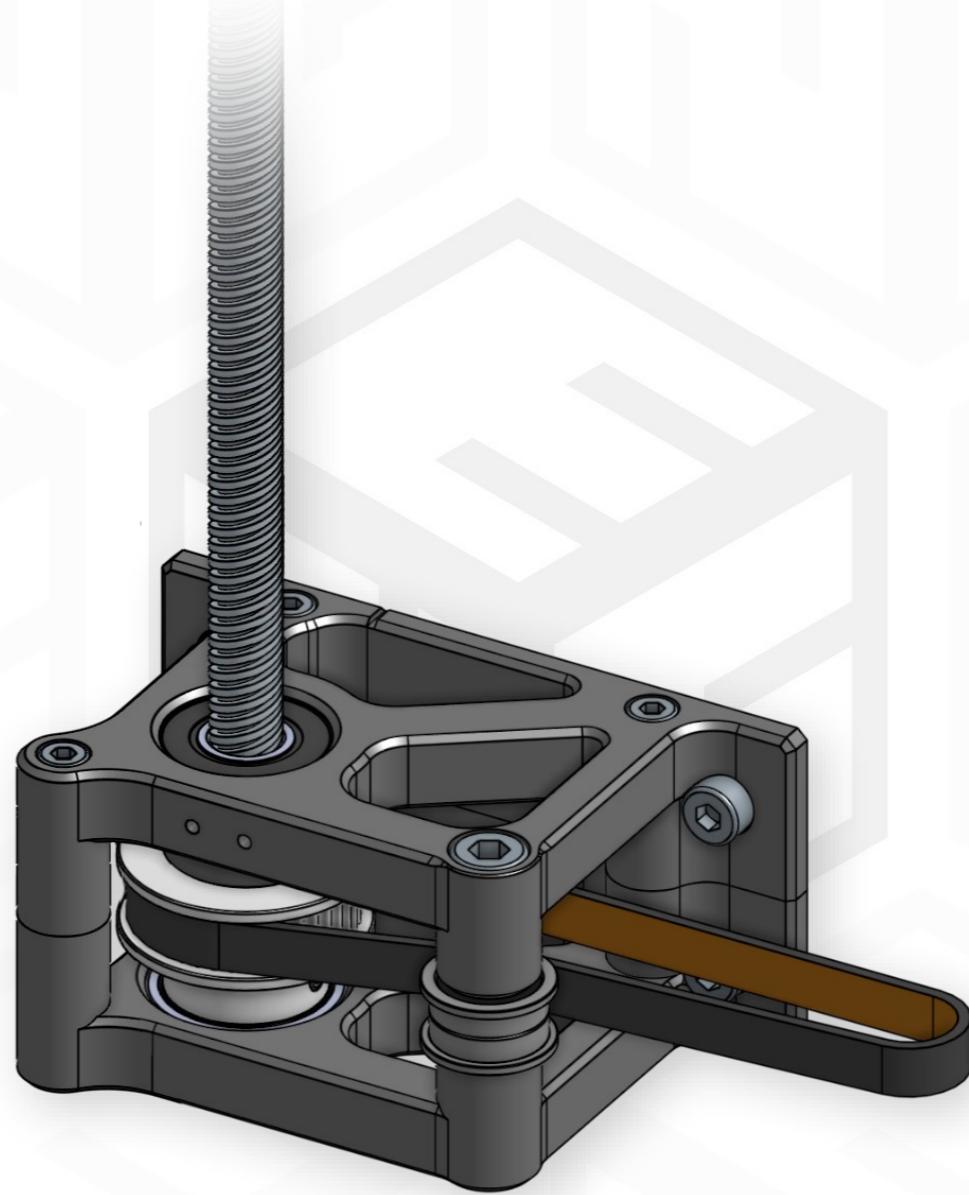


2 Z AXIS RODS

## BOTTOM FRAME REAR Z SUPPORT



SINGLE Z STEPPER MOTOR



THREE Z STEPPER MOTORS

2 Z AXIS RODS

## BOTTOM FRAME REAR Z SUPPORT

### TOOLS:

Heat set insert press

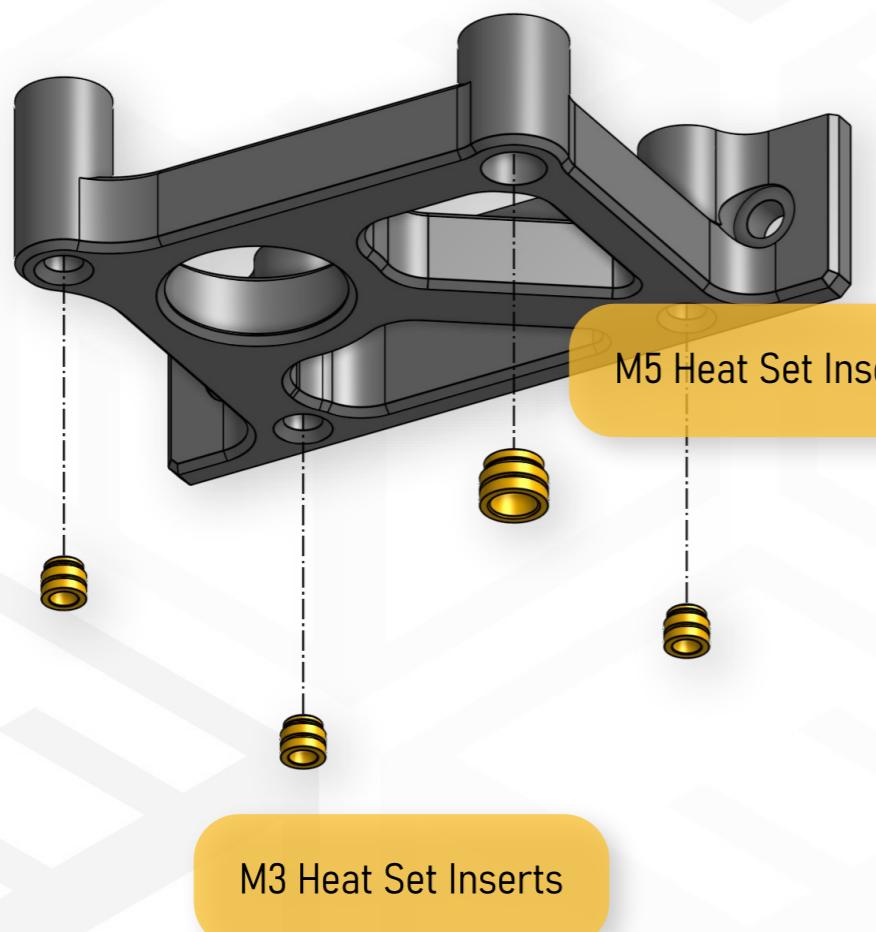
### HARDWARE:

3x M3 Heat set insert  
1x M5 Heat set insert

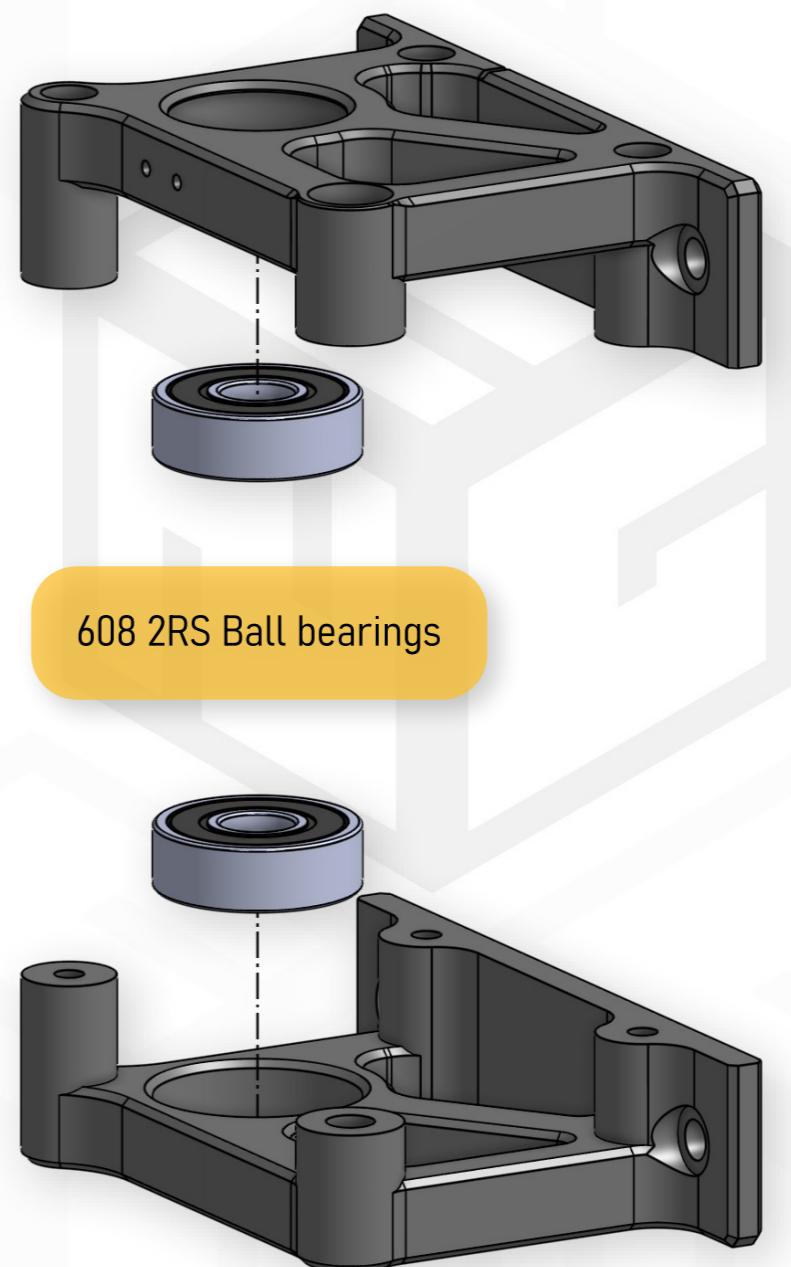
2x 608 2RS Ball bearing

### PRINTED PARTS:

frame\_bottom\_rear\_Z\_lower\_dual.stl  
frame\_bottom\_rear\_Z\_upper\_1140mm.stl



### HEAT SET INSERTS AND BALL BEARINGS INSTALLATION



2 Z AXIS RODS

## BOTTOM FRAME REAR Z SUPPORT

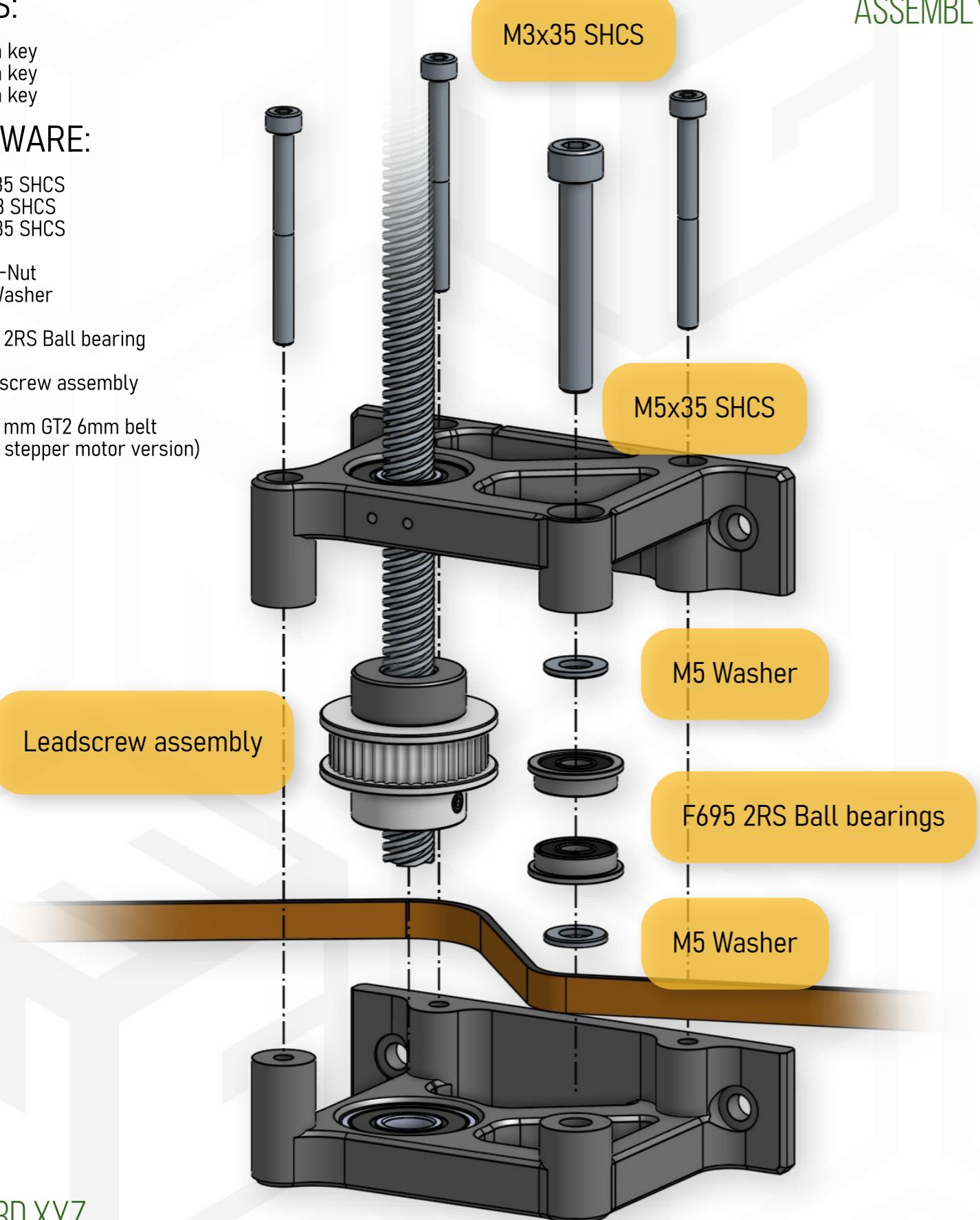
ASSEMBLY

### TOOLS:

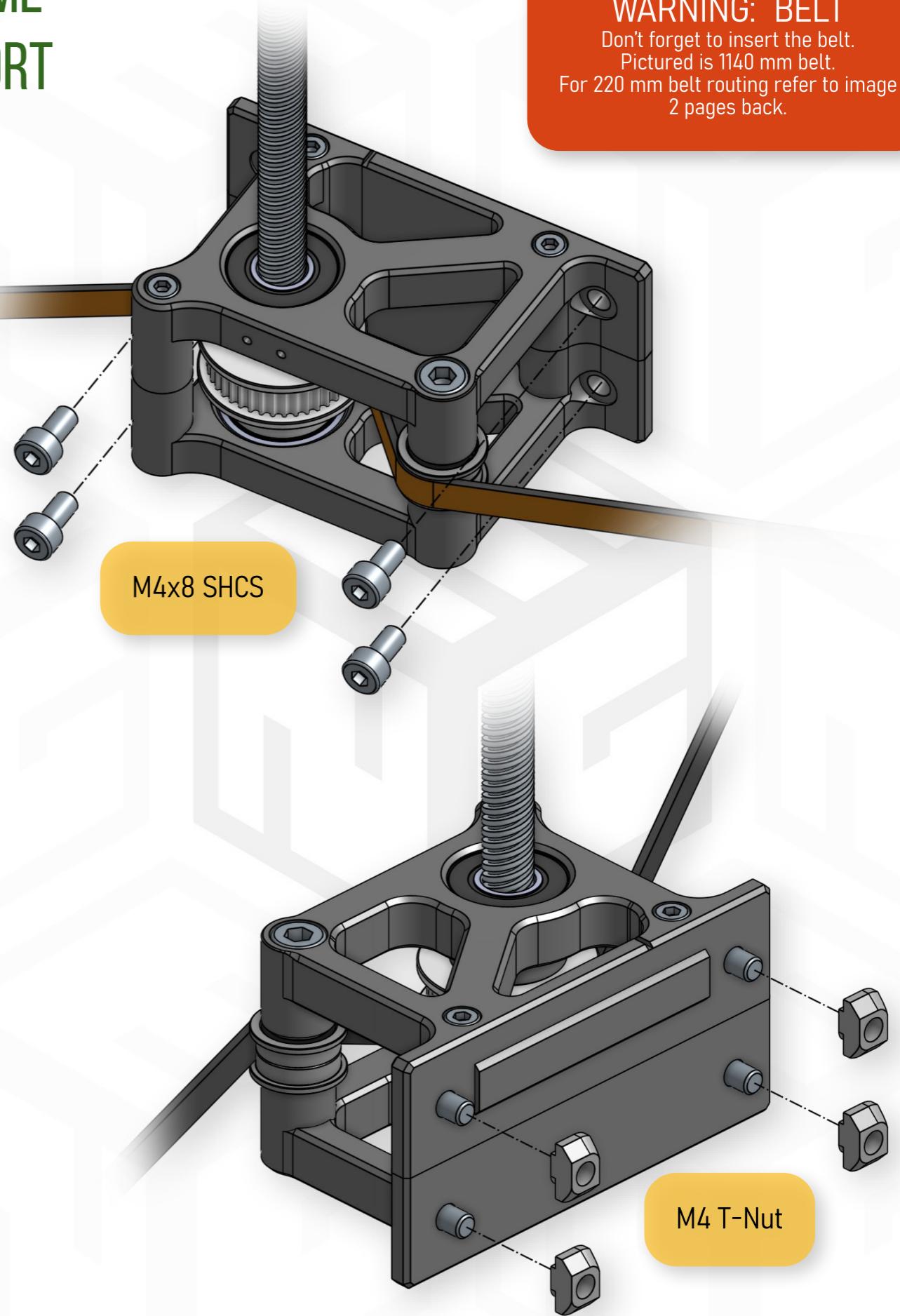
2.5 mm Allen key  
3 mm Allen key  
4 mm Allen key

### HARDWARE:

3x M3x35 SHCS  
4x M4x8 SHCS  
1x M5x35 SHCS  
  
4x M4 T-Nut  
2x M5 Washer  
  
2x F695 2RS Ball bearing  
  
1x Leadscrew assembly  
  
1x 220+ mm GT2 6mm belt  
(3x Z stepper motor version)

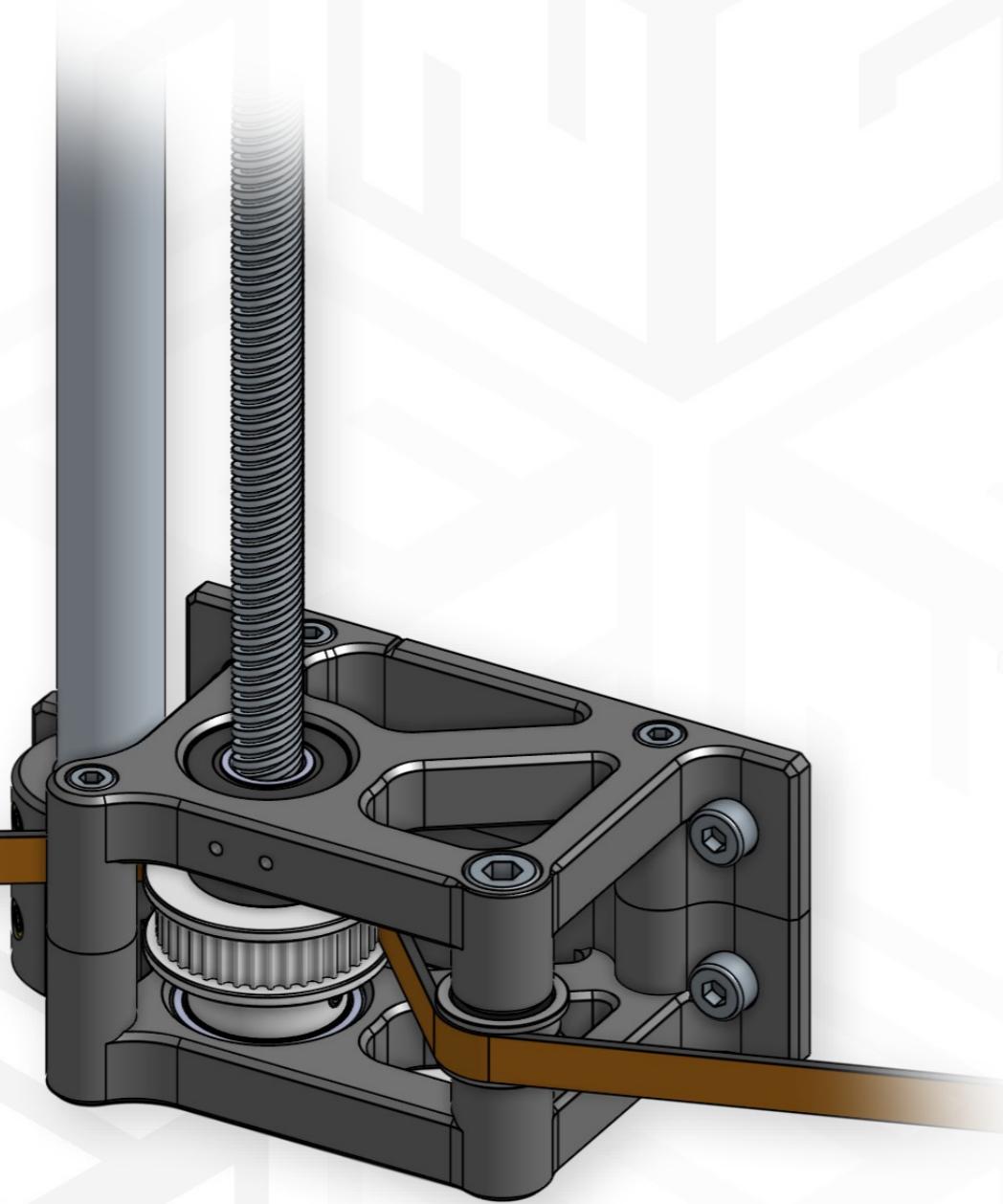


**WARNING: BELT**  
Don't forget to insert the belt.  
Pictured is 1140 mm belt.  
For 220 mm belt routing refer to image  
2 pages back.

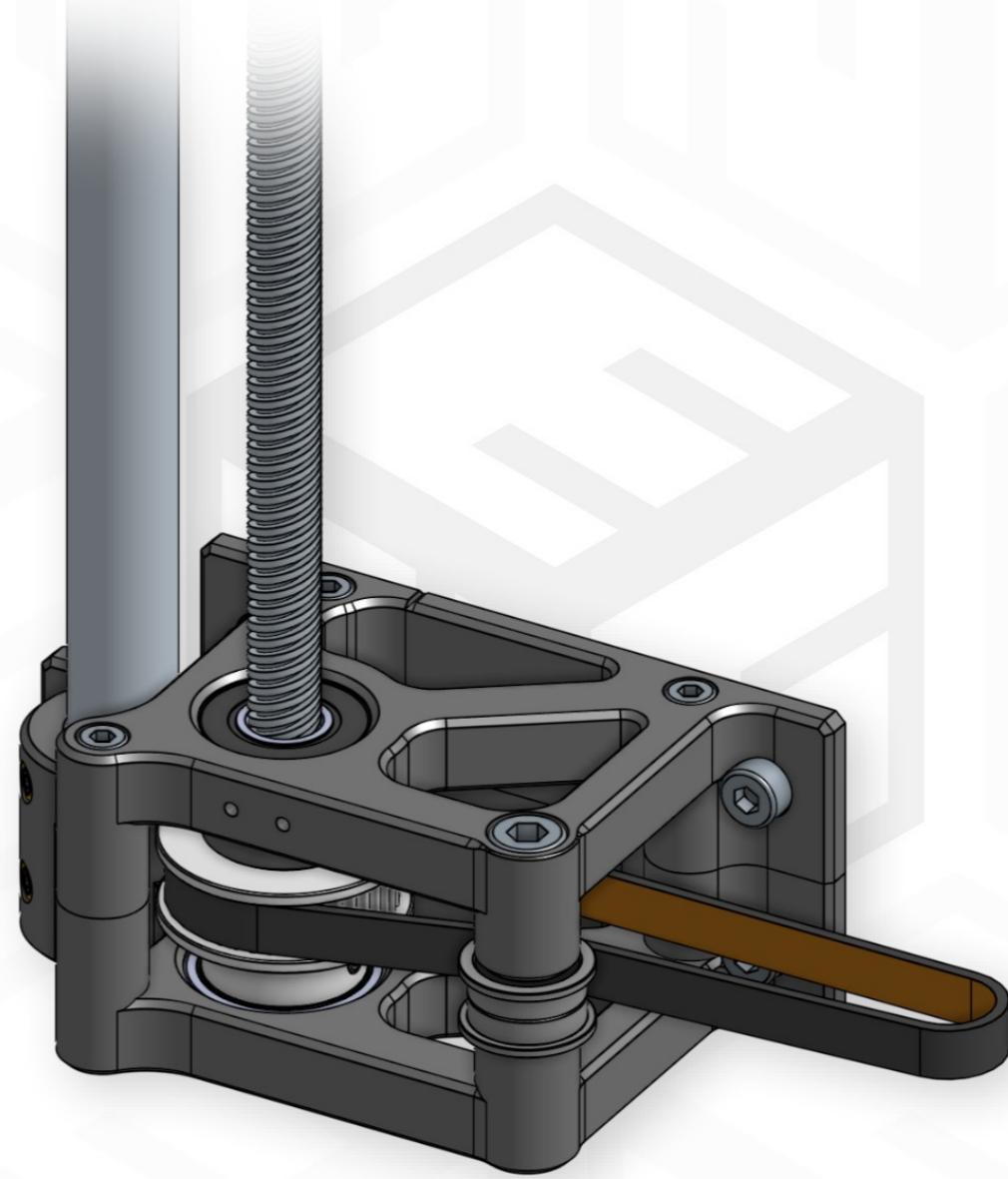


3 Z AXIS RODS

## BOTTOM FRAME REAR Z SUPPORT



SINGLE Z STEPPER MOTOR



THREE Z STEPPER MOTORS

3 Z AXIS RODS

## BOTTOM FRAME REAR Z SUPPORT

### TOOLS:

Heat set insert press

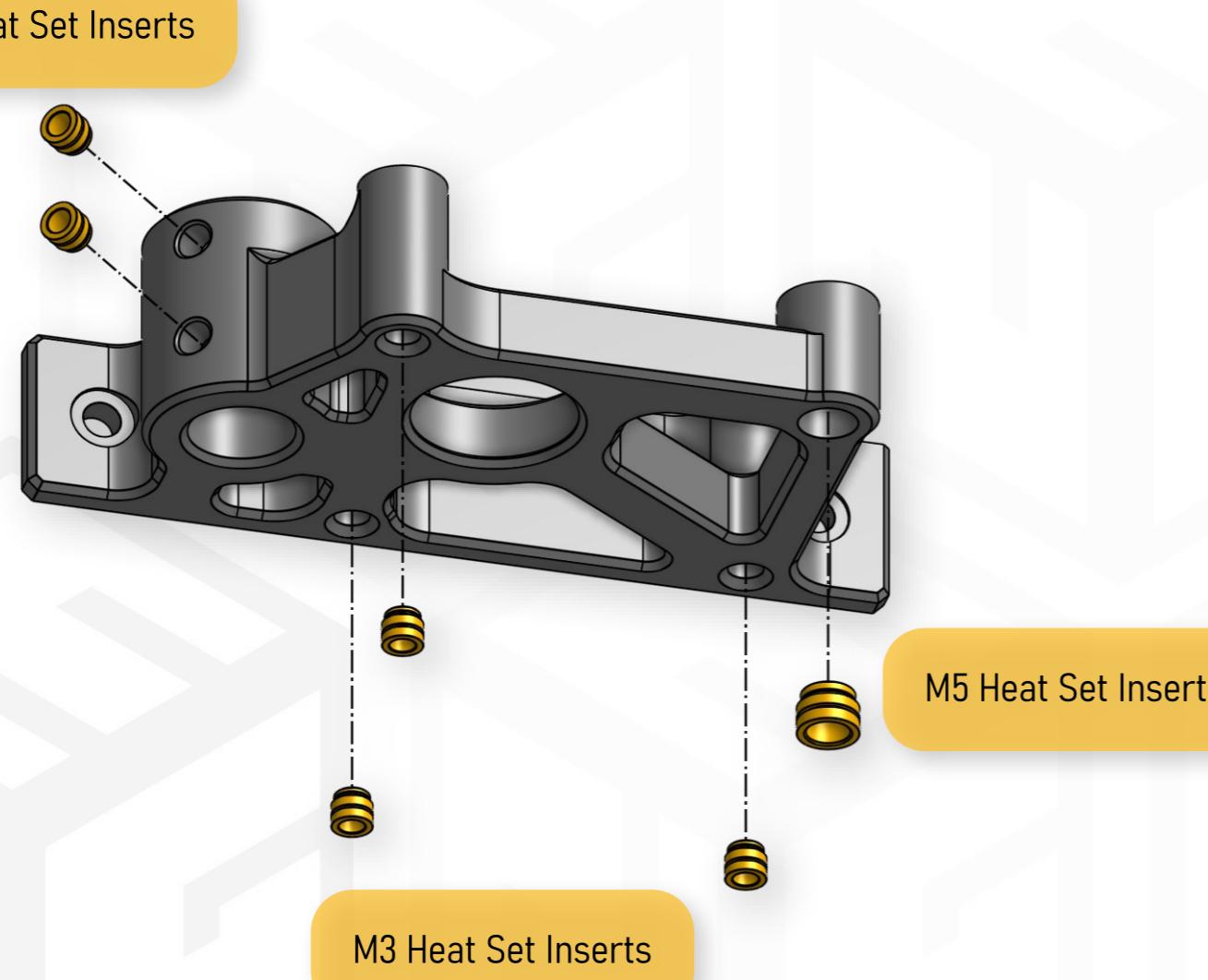
### HARDWARE:

5x M3 Heat set insert  
1x M5 Heat set insert

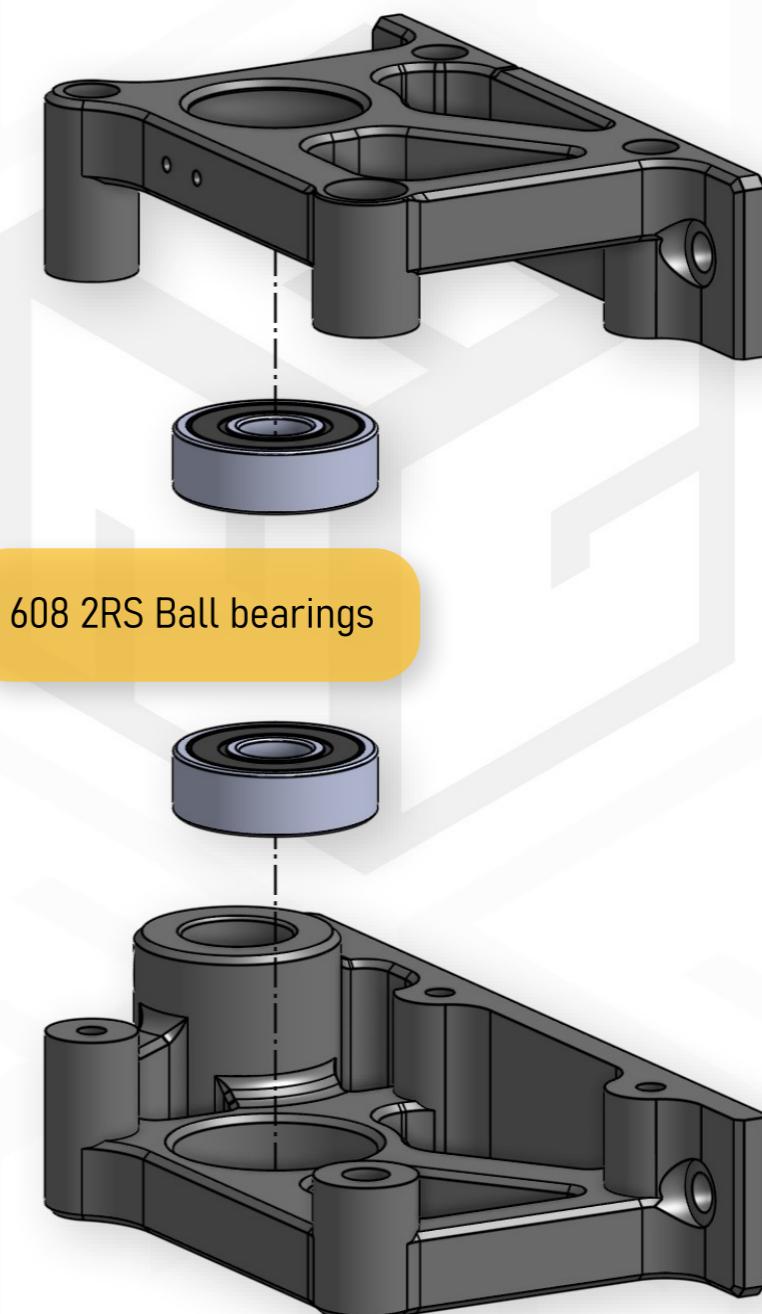
2x 608 2RS Ball bearing

### PRINTED PARTS:

frame\_bottom\_rear\_Z\_lower\_triple.stl  
frame\_bottom\_rear\_Z\_upper\_1140mm.stl



### HEAT SET INSERTS AND BALL BEARINGS INSTALLATION



3 Z AXIS RODS

# BOTTOM FRAME REAR Z SUPPORT

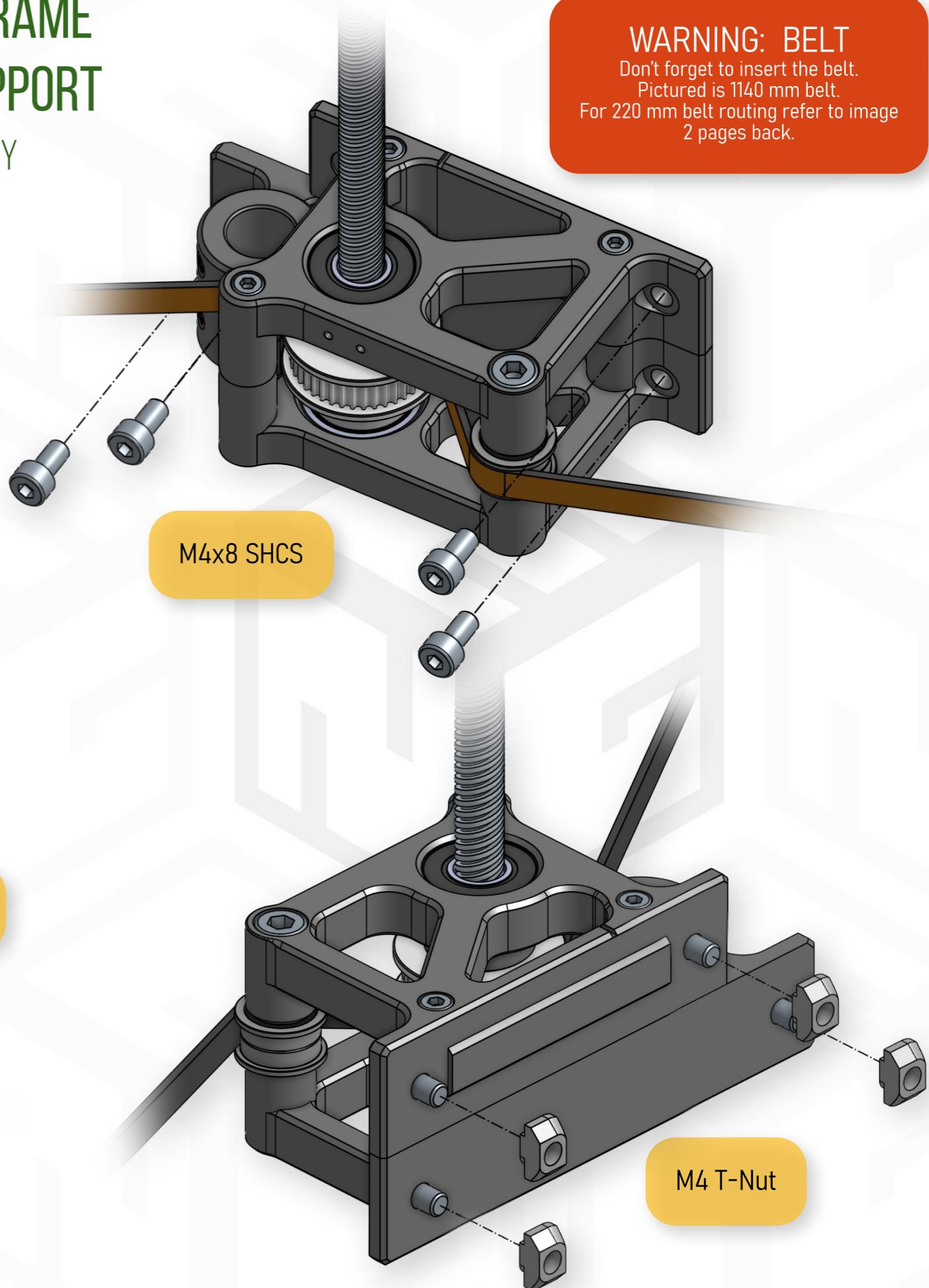
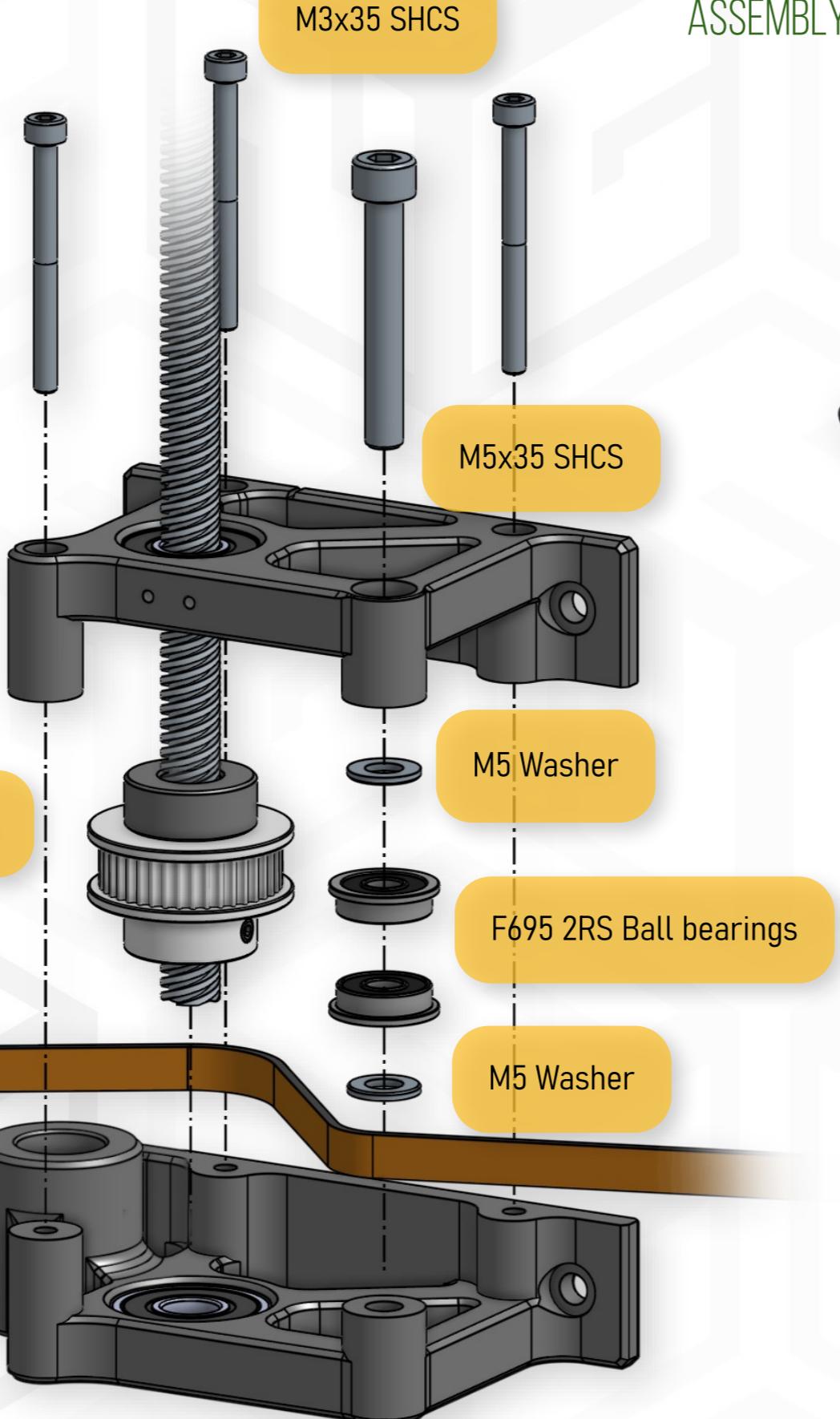
ASSEMBLY

## TOOLS:

1.5 mm Allen key  
2.5 mm Allen key  
3 mm Allen key  
4 mm Allen key

## HARDWARE:

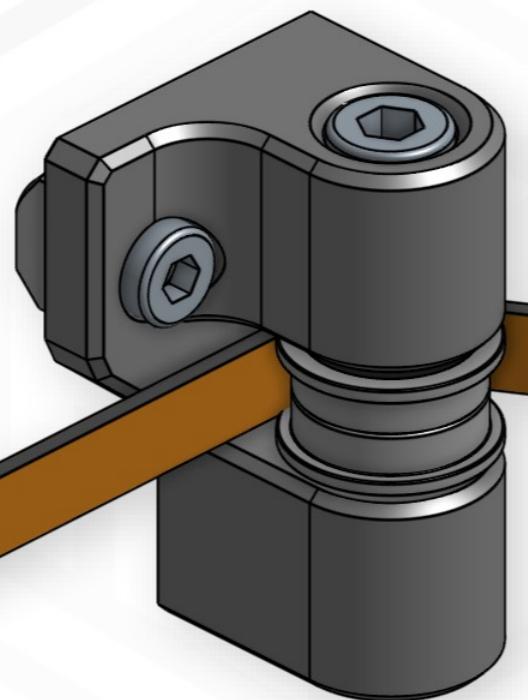
3x	M3x35 SHCS
4x	M4x8 SHCS
1x	M5x35 SHCS
2x	M3x5 Setscrew
4x	M4 T-Nut
2x	M5 Washer
2x	F695 2RS Ball bearing
1x	Leadscrew assembly
1x	220+ mm GT2 6mm belt (3x Z stepper motor version)



**WARNING: BELT**  
Don't forget to insert the belt.  
Pictured is 1140 mm belt.  
For 220 mm belt routing refer to image  
2 pages back.

Z AXIS DRIVE: 1 STEPPER

## BOTTOM FRAME Z BELT IDLER / TENSIONER



Z AXIS DRIVE: 1 STEPPER

## BOTTOM FRAME Z BELT IDLER / TENSIONER

### TOOLS:

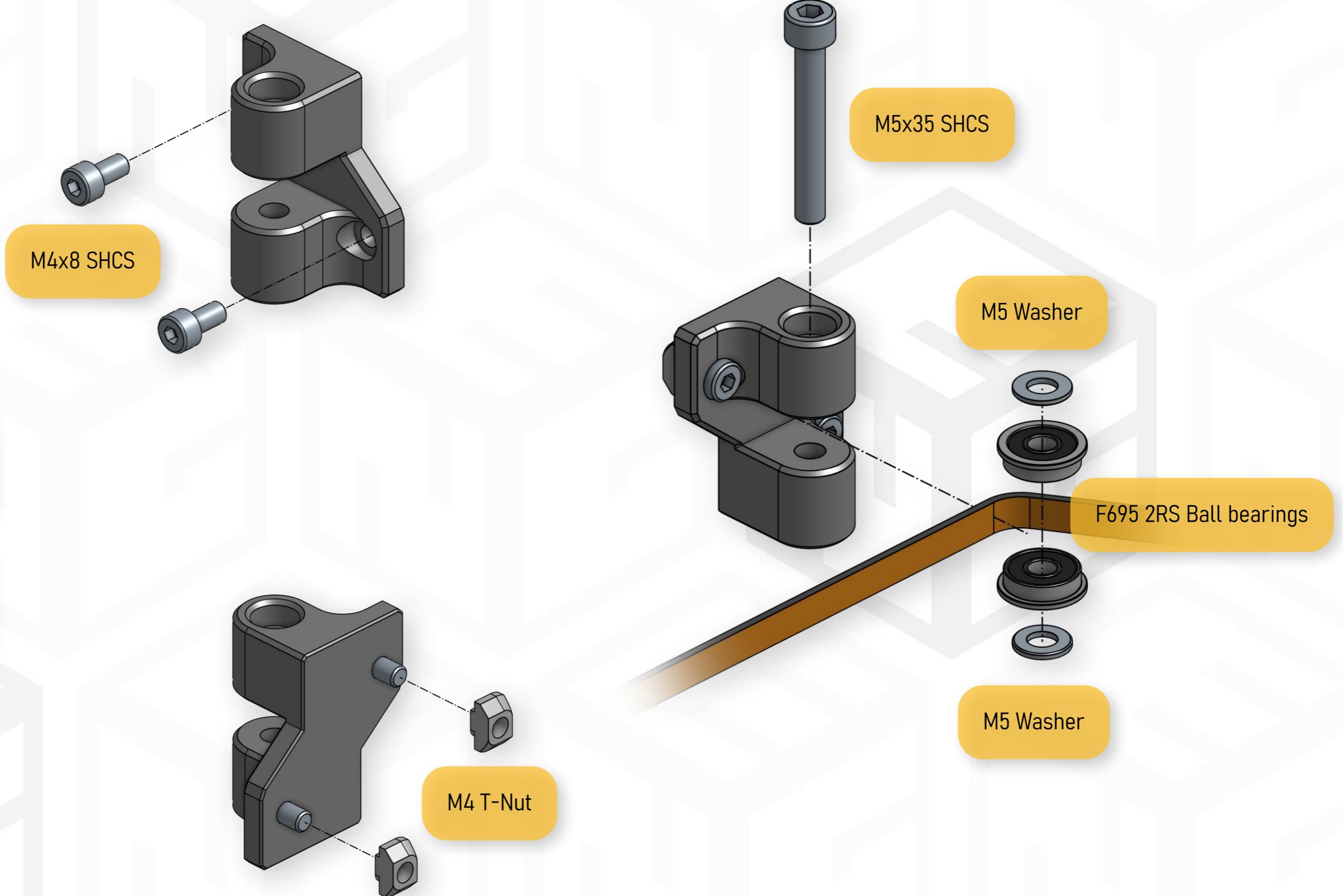
Heat set insert press  
3 mm Allen key  
4 mm Allen key

### HARDWARE:

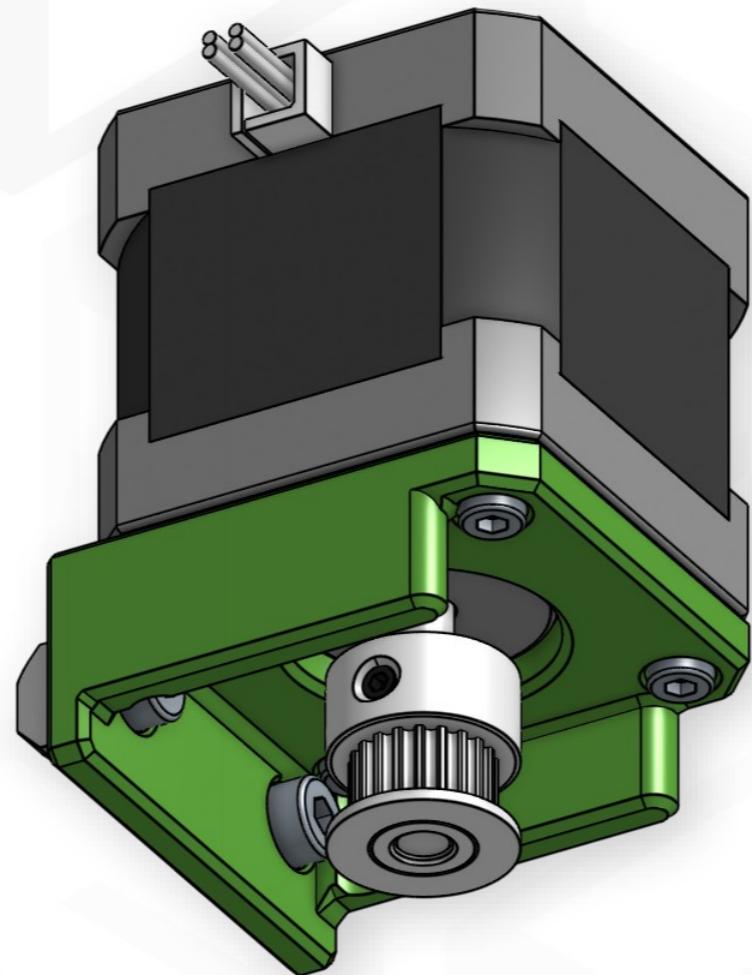
1x M5 Heat set insert  
2x M4x8 SHCS  
1x M5x35 SHCS  
2x M4 T-Nut  
2x M5 Washer  
2x F695 2RS Ball bearing

### PRINTED PARTS:

frame\_bottom\_Z\_idler.stl



## BOTTOM FRAME Z STEPPER MOTOR ASSEMBLY



## TOOLS:

1.5 mm Allen key  
2.5 mm Allen key  
3 mm Allen key

## HARDWARE:

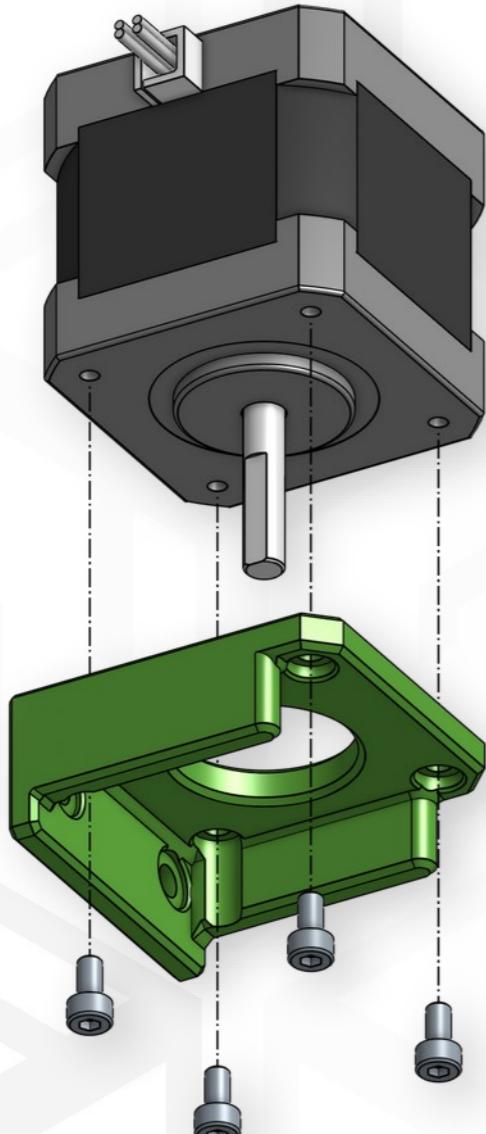
4x M3x6 SHCS  
2x M4x8 SHCS

2x M4 T-Nut

1x GT2 20T 5mm Pulley  
1x Nema17 stepper motor

## PRINTED PARTS:

frame\_bottom\_Z\_stepper.stl

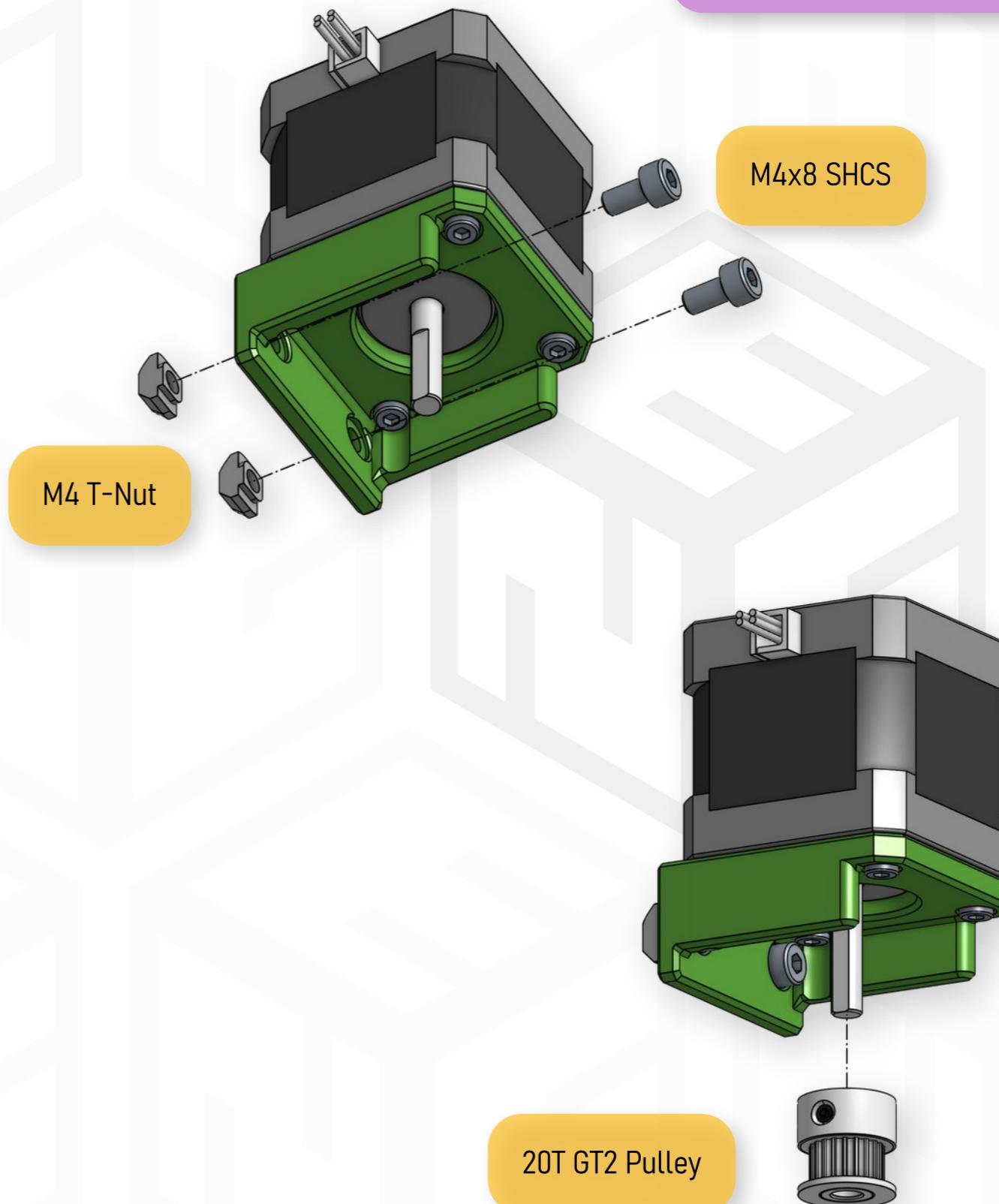


M3x6 SHCS

# BOTTOM FRAME Z STEPPER MOTOR ASSEMBLY

## Z AXIS DRIVE

For version with three independent Z stepper motors, repeat this process so you have three Z stepper motor assemblies.



20T GT2 Pulley

## TOOLS:

3 mm Allen key

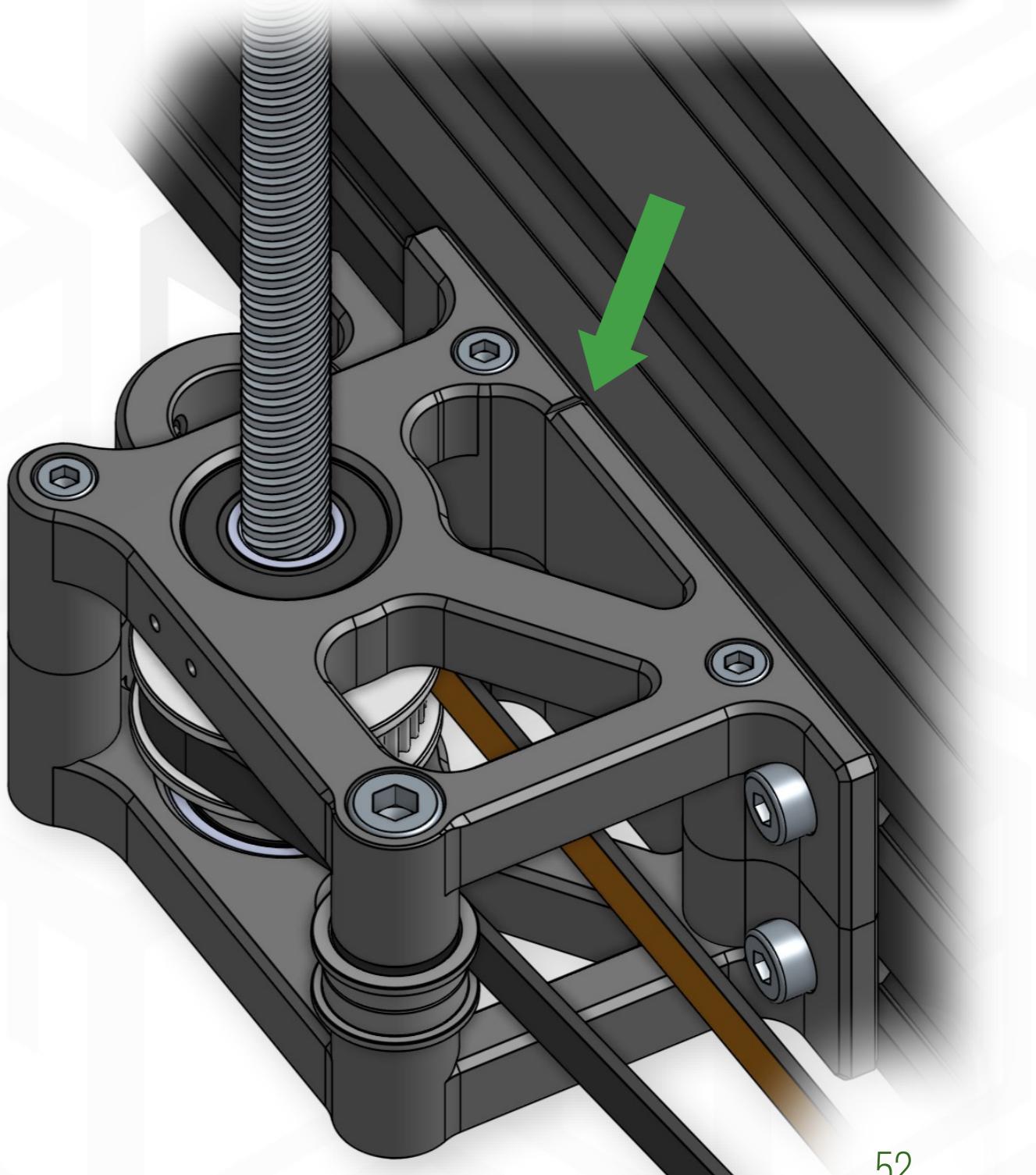
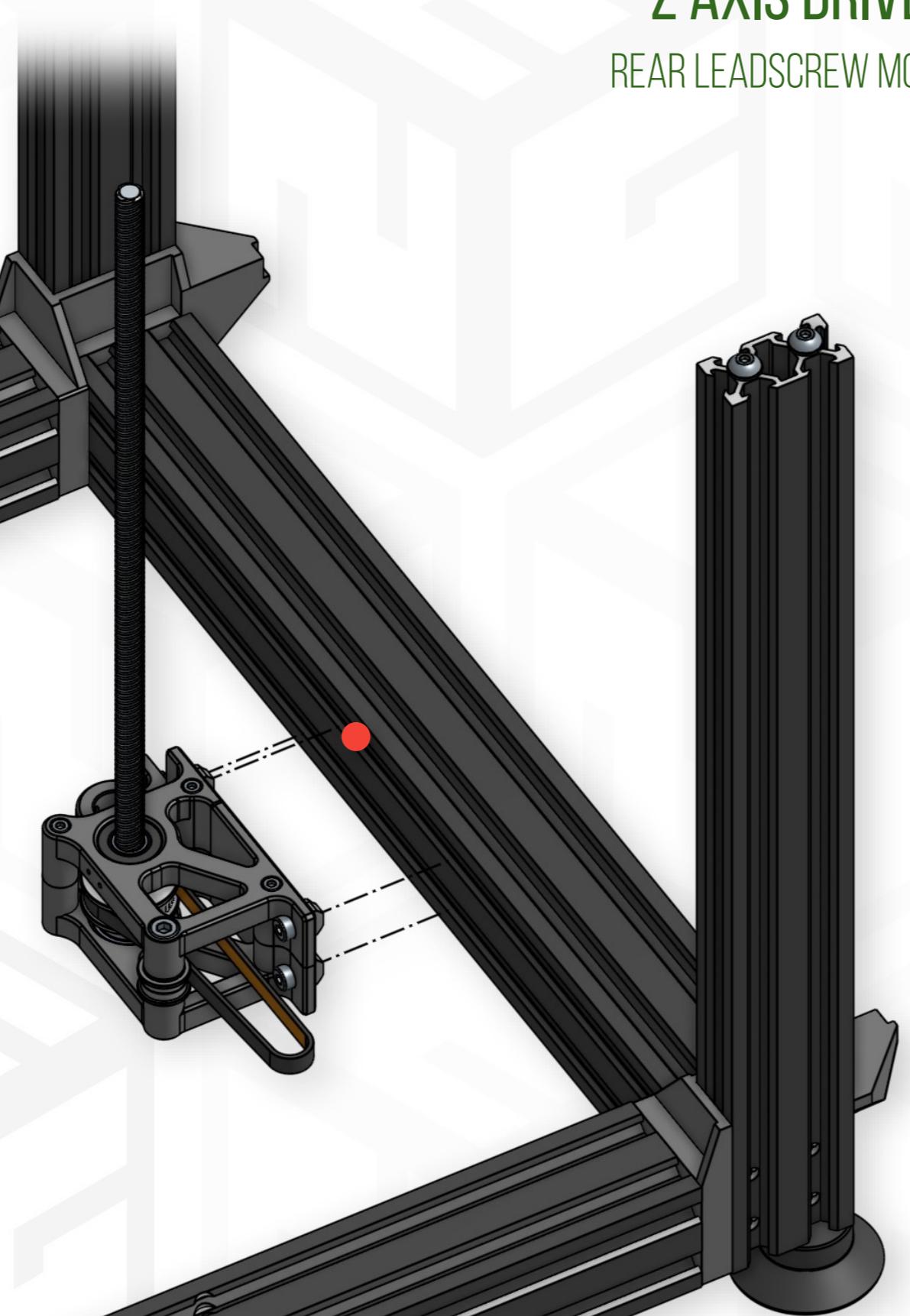
# BOTTOM FRAME Z AXIS DRIVE REAR LEADScrew MOUNT

## NOTE: ALIGNMENT

To move the rear leadscrew assembly into the right position, align the extrusion middle mark with the mark on the printed piece top side.

## VERSION COMPATIBILITY

This installation step is same for all versions.

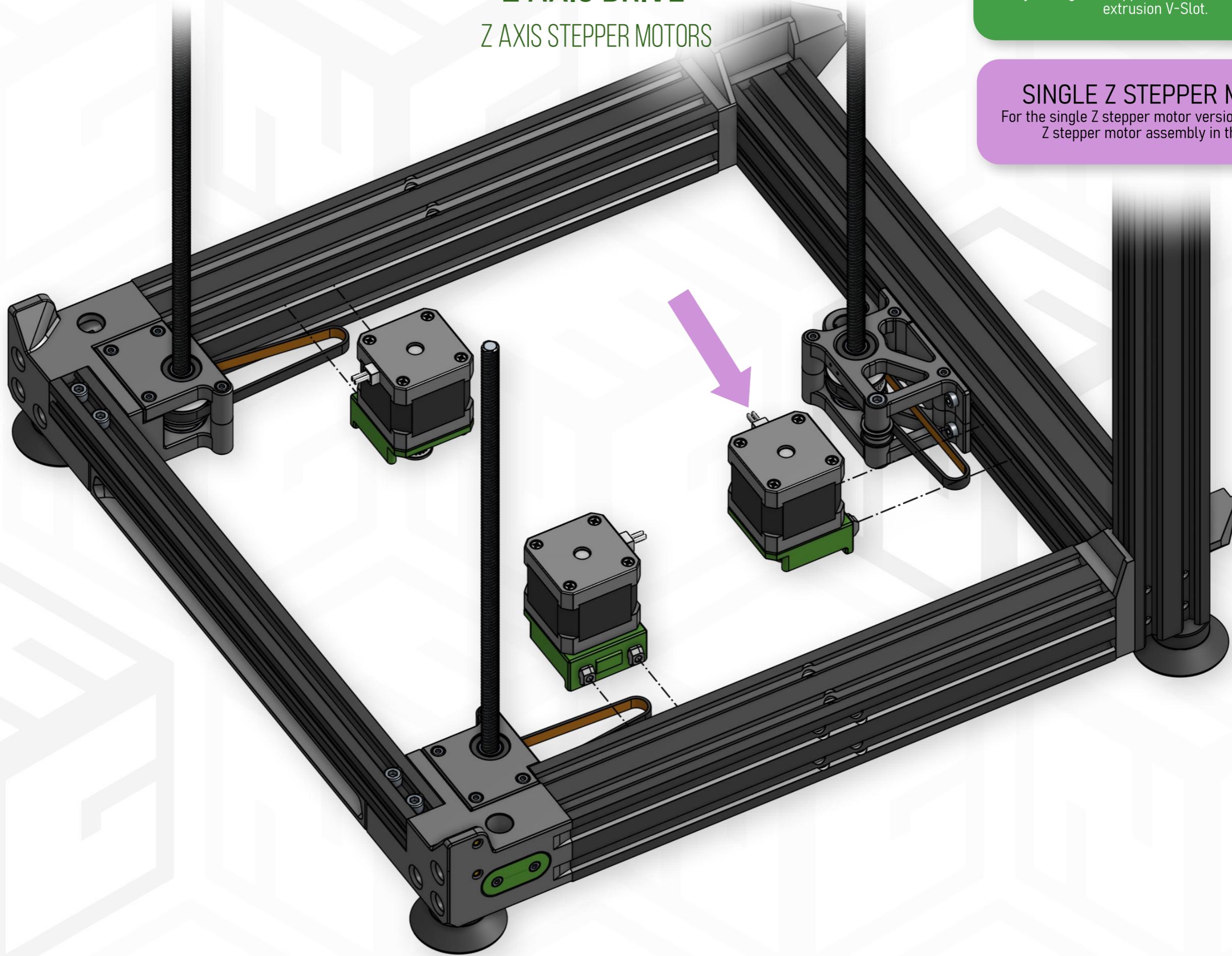


## TOOLS:

3 mm Allen key

# BOTTOM FRAME Z AXIS DRIVE

## Z AXIS STEPPER MOTORS



### NOTE: BELT TENSIONING

Belt tensioning for the three Z belts is done by sliding the stepper motor assembly in the extrusion V-Slot.

### SINGLE Z STEPPER MOTOR

For the single Z stepper motor version, install only Z stepper motor assembly in the rear.

SINGLE Z STEPPER MOTOR

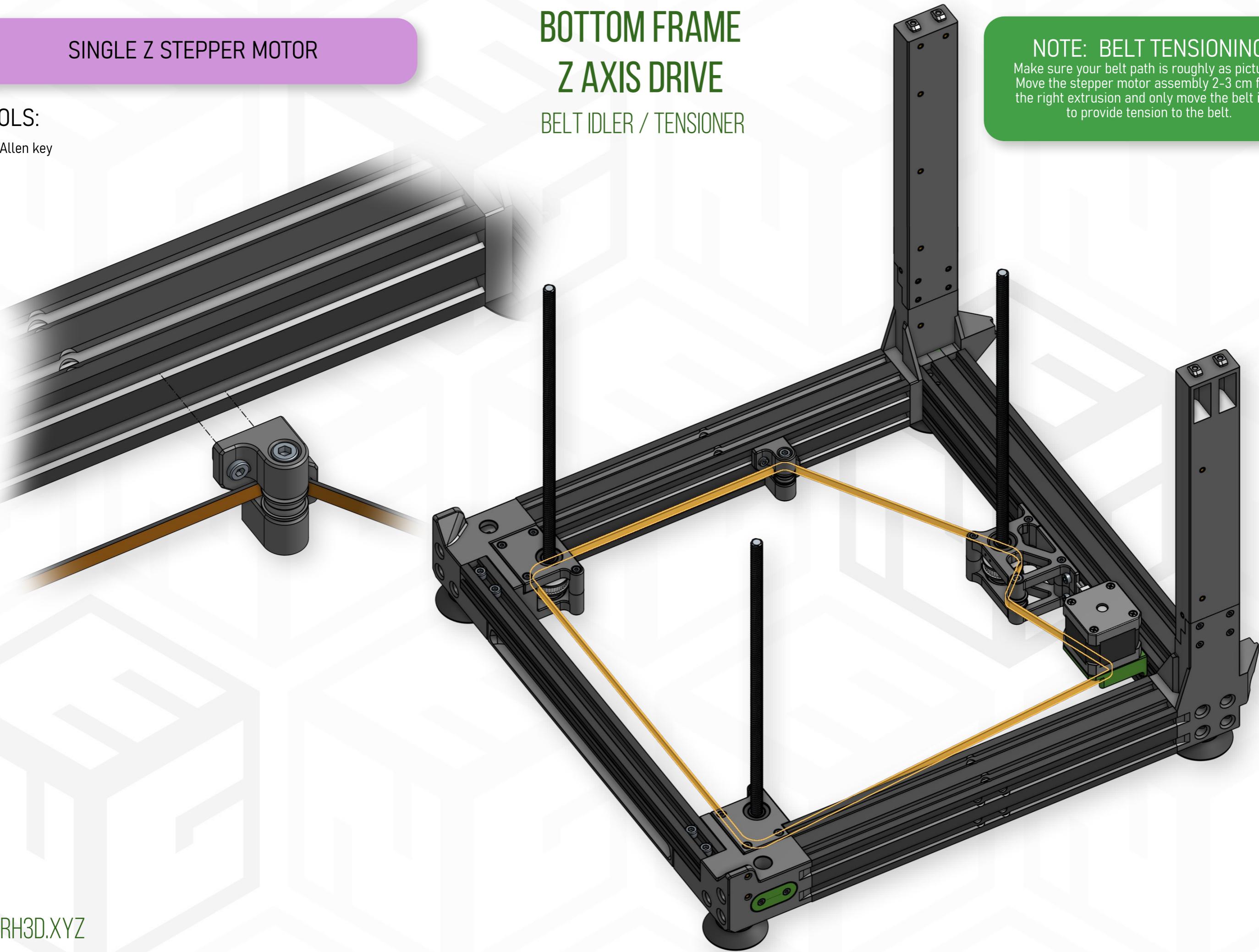
TOOLS:

3 mm Allen key

## BOTTOM FRAME Z AXIS DRIVE

### BELT IDLER / TENSIONER

**NOTE: BELT TENSIONING**  
Make sure your belt path is roughly as pictured.  
Move the stepper motor assembly 2-3 cm from  
the right extrusion and only move the belt idler  
to provide tension to the belt.



## TOOLS:

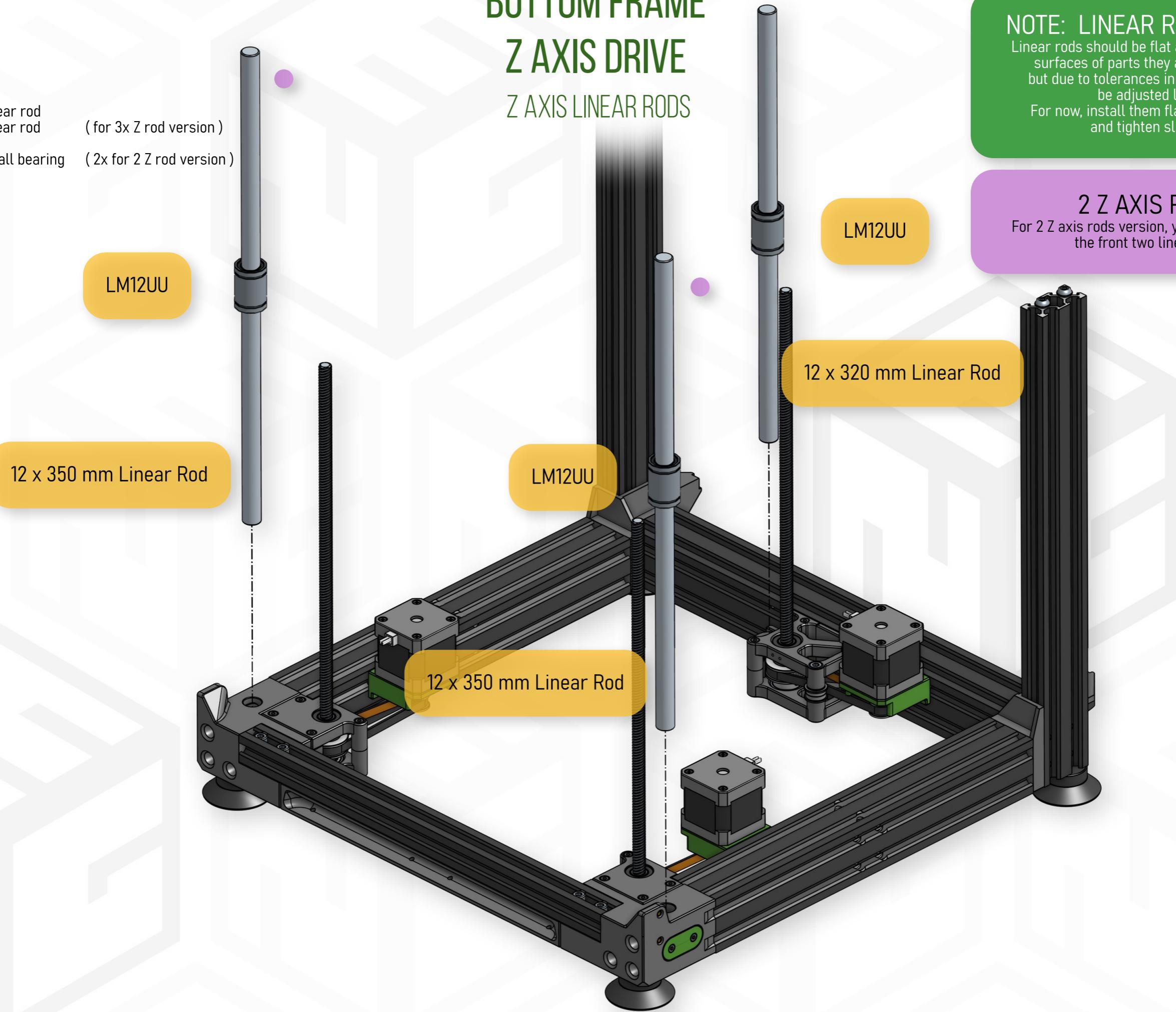
1.5 mm Allen key  
2.5 mm Allen key

## HARDWARE:

2x 12 x 350 mm Linear rod  
1x 12 x 320 mm Linear rod ( for 3x Z rod version )  
3x LM12UU Linear ball bearing ( 2x for 2 Z rod version )

# BOTTOM FRAME Z AXIS DRIVE

## Z AXIS LINEAR RODS



**NOTE: LINEAR ROD INSTALL**  
Linear rods should be flat against the bottom surfaces of parts they are inserted to, but due to tolerances in length, this will be adjusted later.  
For now, install them flat to the bottom and tighten slightly.

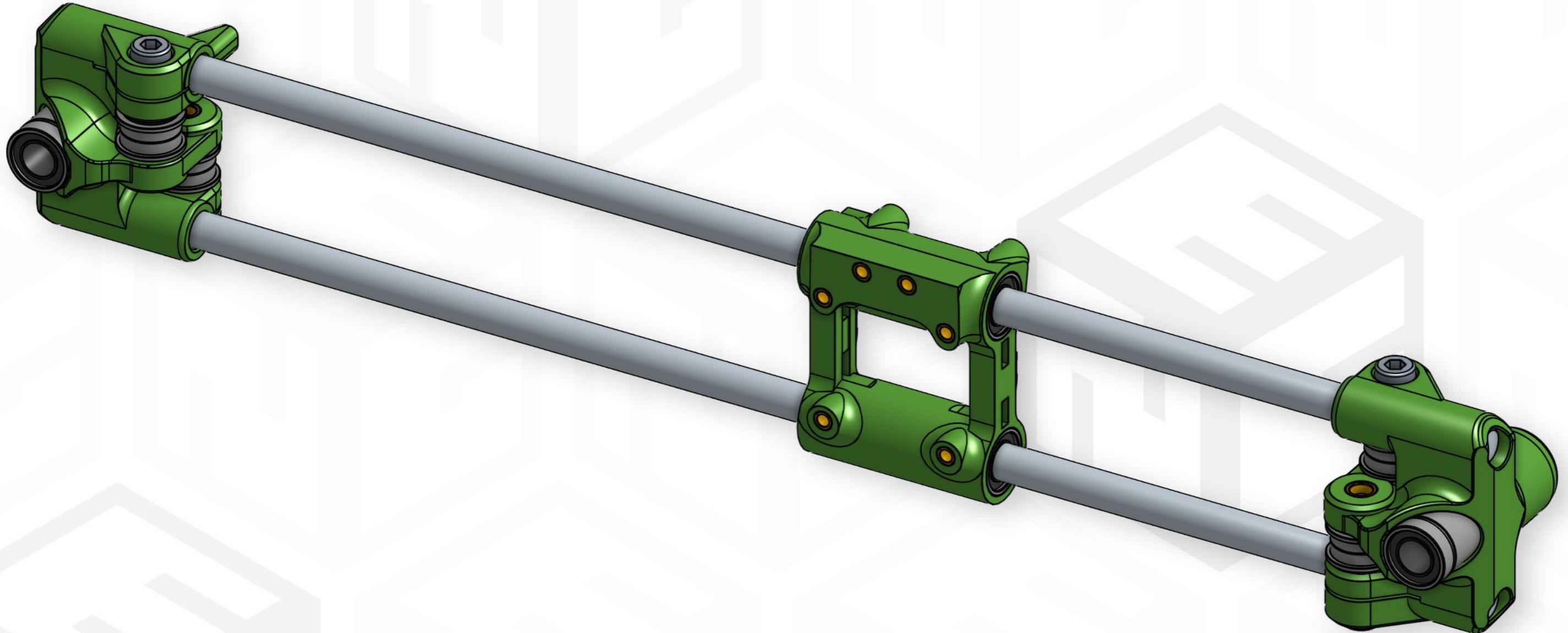
## 2 Z AXIS RODS

For 2 Z axis rods version, you will only install the front two linear rods.

# XY GANTRY

**WARNING: LM8LUU**

Did you clean and lubricate the LM8LUU bearings?



## TOOLS:

Heat set insert press  
4 mm Allen key

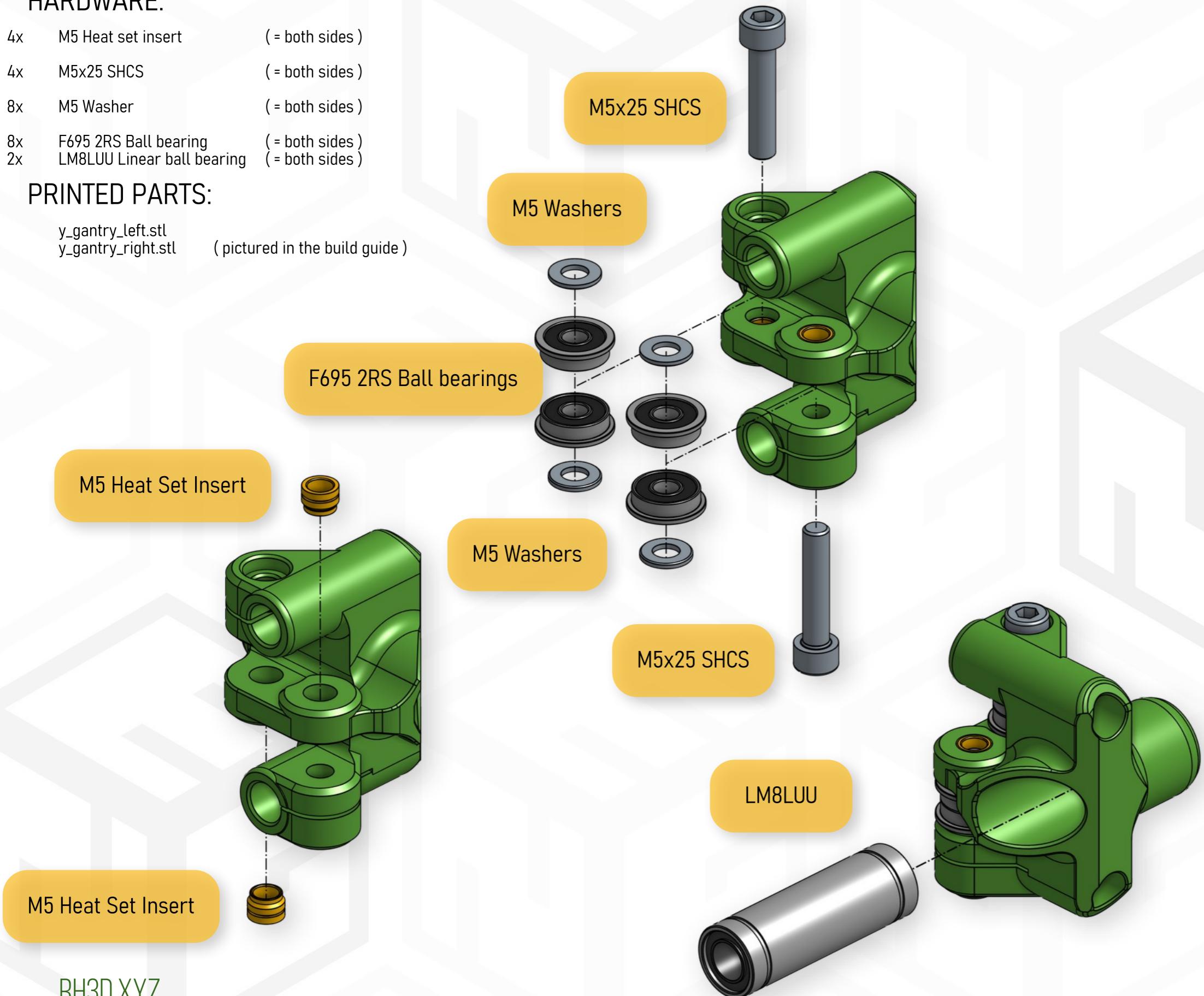
## HARDWARE:

4x	M5 Heat set insert	( = both sides )
4x	M5x25 SHCS	( = both sides )
8x	M5 Washer	( = both sides )
8x	F695 2RS Ball bearing	( = both sides )
2x	LM8LUU Linear ball bearing	( = both sides )

## PRINTED PARTS:

y\_gantry\_left.stl  
y\_gantry\_right.stl  
( pictured in the build guide )

# XY GANTRY Y GANTRY BLOCKS



### NOTE: SYMMETRY

Left and right sides are basically symmetrical, therefore only one is shown here.  
Repeat this process for the other side.

### TIP: PRECISION FIT

The hole for LM8LUU is designed as a press fit, with a proper calibration, the bearing is easy to install without excessive force and will stay in place. If the fit is too tight, increase the hole clearance with a proper tool, if the fit is too loose, rough up the hole surface or use a shim or tape.

### TIP: HEAT SET INSERT INSTALL

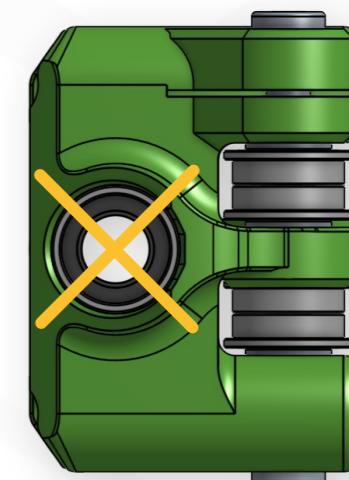
The M5 inserts are in a tight place with no room for standard install procedure. To install them, use the tool tip under an angle to heat up the insert and slowly push in. When close to the final position, use M5 screw to pull the insert from the other side to align it. Take your time and don't rush the process, if it doesn't work the 1st time, reheat the insert and continue.

### WARNING: REMOVE SUPPORT

Break off the built-in 2 supports marked with .

### WARNING: LM8LUU INSTALL

Install the linear bearings so the ball traces inside form a pattern, not a pattern.



## TOOLS:

Heat set insert press

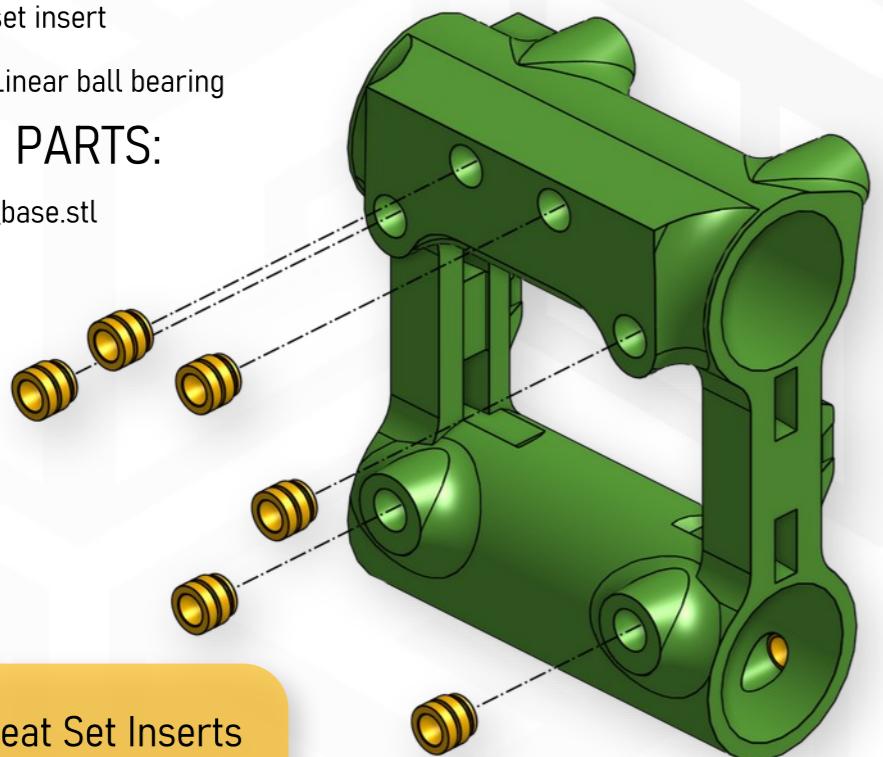
## HARDWARE:

10x M3 Heat set insert

2x LM8LUU Linear ball bearing

## PRINTED PARTS:

toolhead\_base.stl



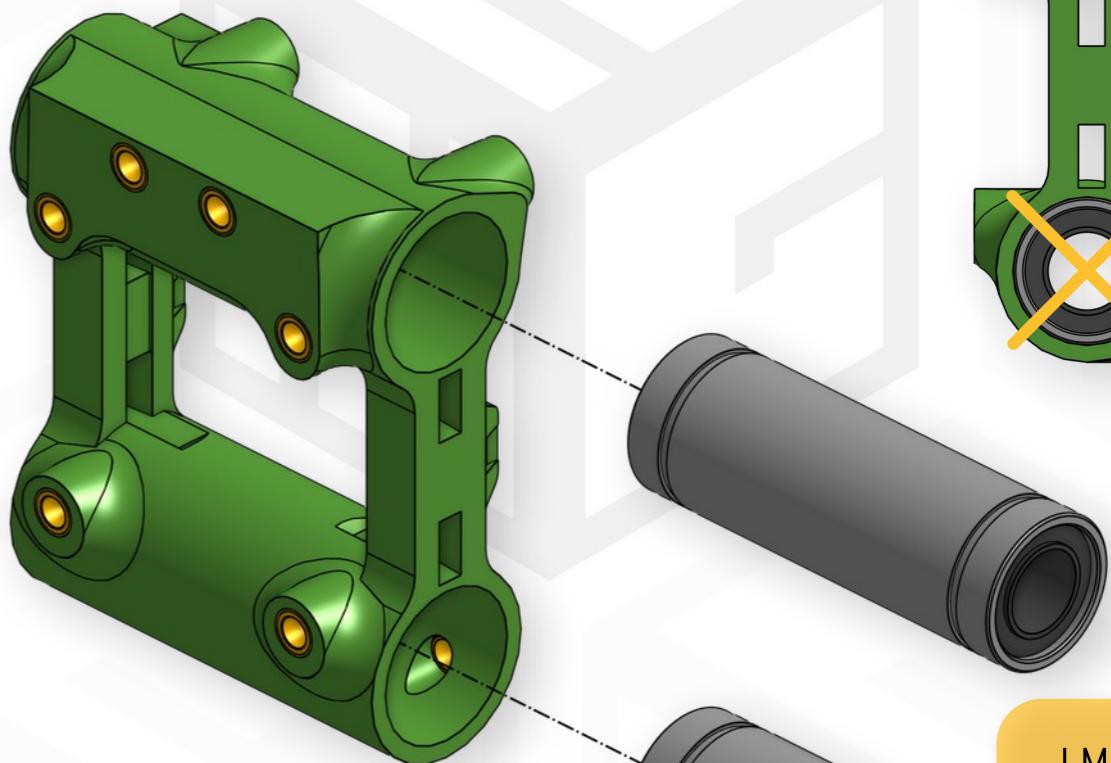
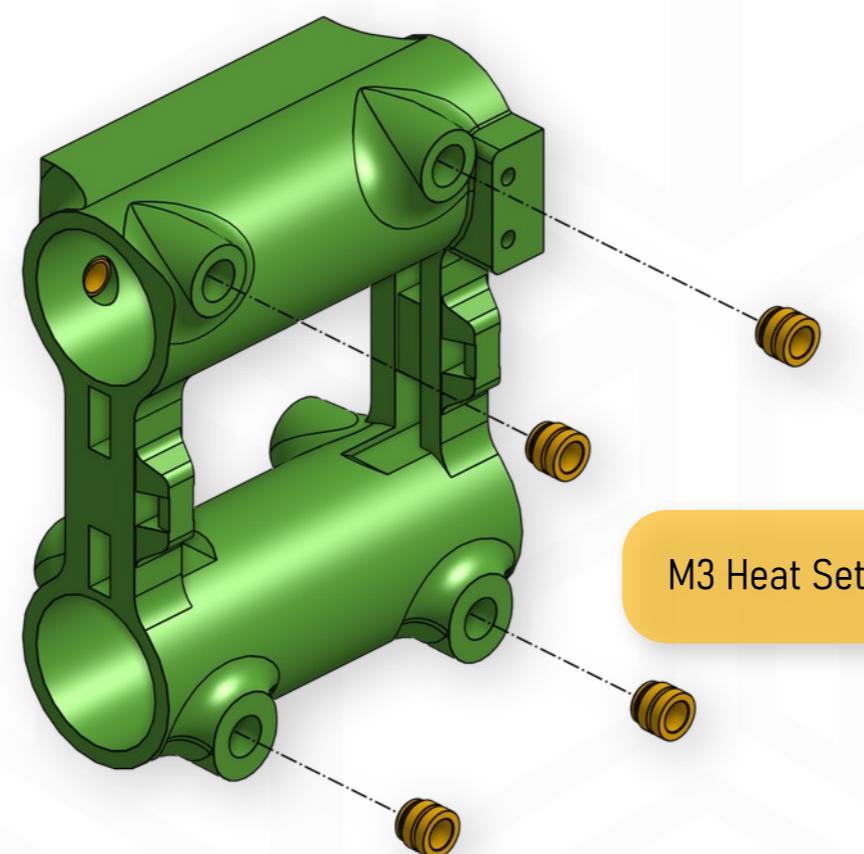
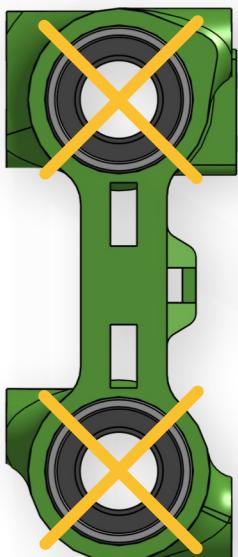
# XY GANTRY X CARRIAGE

## TIP: PRECISION FIT

The hole for LM8LUU is designed as a press fit, with a proper calibration, the bearing is easy to install without excessive force and will stay in place. If the fit is too tight, increase the hole clearance with a proper tool, if the fit is too loose, rough up the hole surface or use a shim or tape..

## WARNING: LM8LUU INSTALL

Install the linear bearings so the ball traces inside form a **X** pattern, not a **+** pattern.



## TOOLS:

4 mm Allen key

## HARDWARE:

2x 8 x 350 mm Linear rod

## ASSEMBLIES:

Y Gantry left  
Y Gantry right  
X Carriage

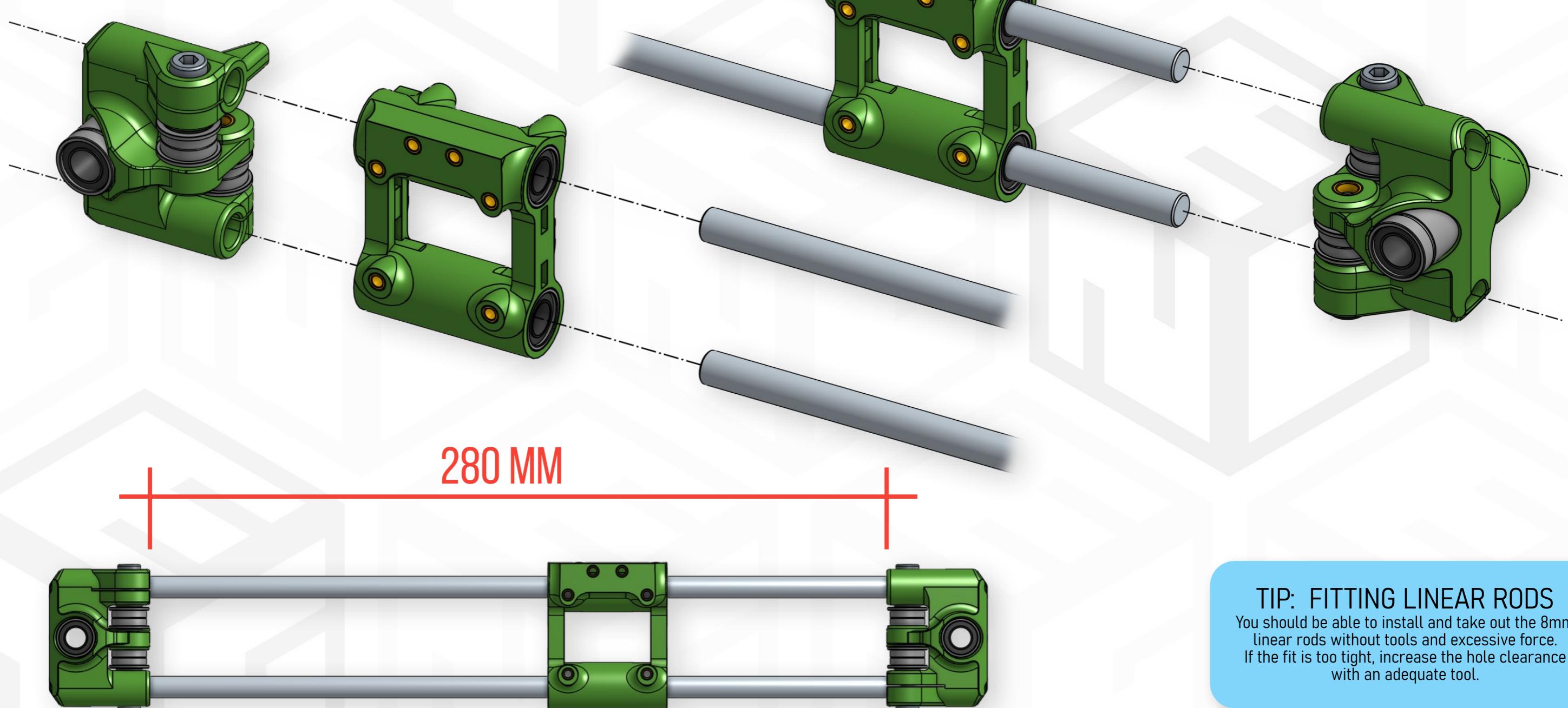
# XY GANTRY ASSEMBLY

## NOTE: X SPACING

Y gantry blocks spacing should be 280 mm, but due to print and assembly inconsistencies, it can vary slightly and we will adjust the spacing properly later, so don't fully tighten the M5 screws.

## WARNING: ORIENTATION

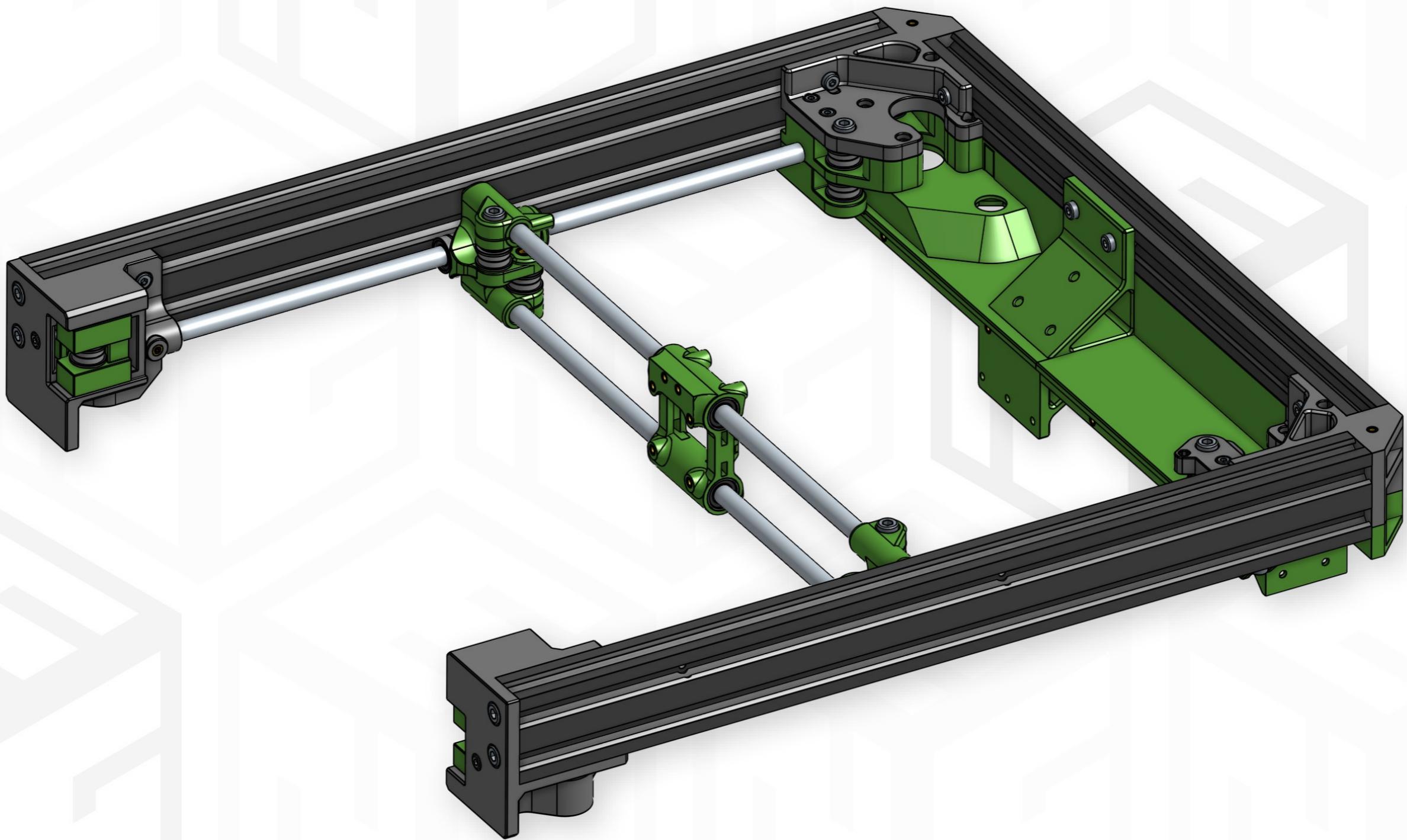
Look at the pictures carefully and follow the parts orientation as shown.



## TIP: FITTING LINEAR RODS

You should be able to install and take out the 8mm linear rods without tools and excessive force. If the fit is too tight, increase the hole clearance with an adequate tool.

# TOP FRAME



## TOOLS:

Heat set insert press

## HARDWARE:

3x M3 Heat set insert  
2x M5 Heat set insert

## PRINTED PARTS:

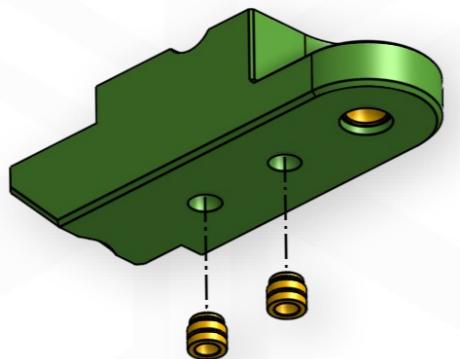
frame\_top\_rear\_B\_left\_top.stl  
frame\_top\_rear\_B\_left\_middle.stl  
frame\_top\_rear\_B\_left\_bottom.stl

# TOP FRAME B STEPPER MOTOR MOUNT (LEFT)

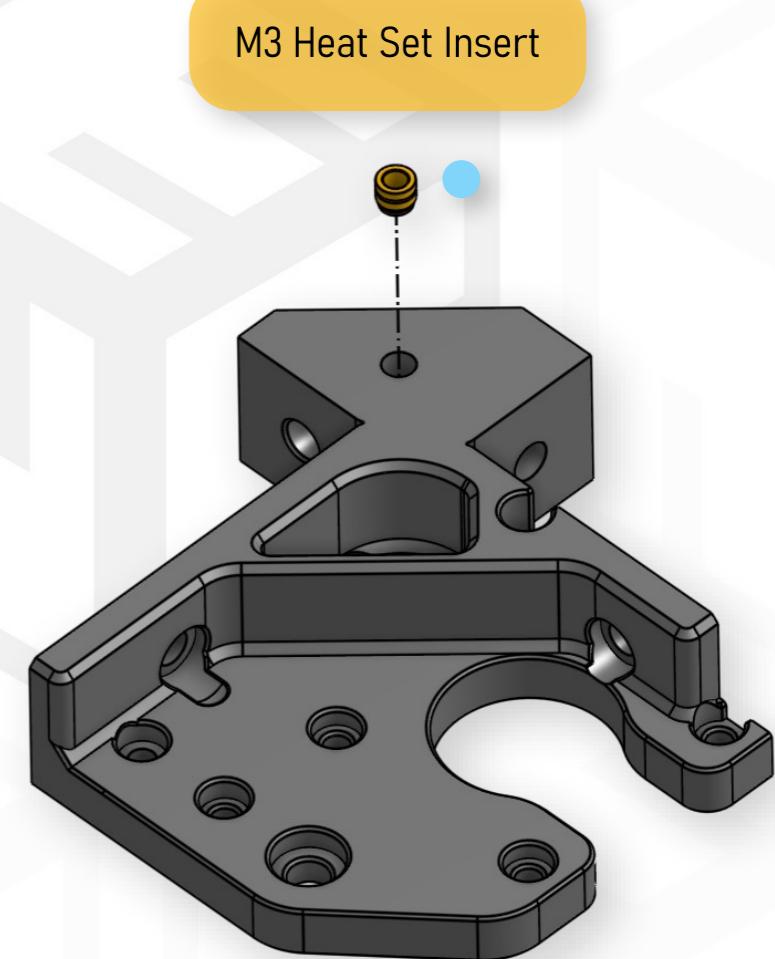
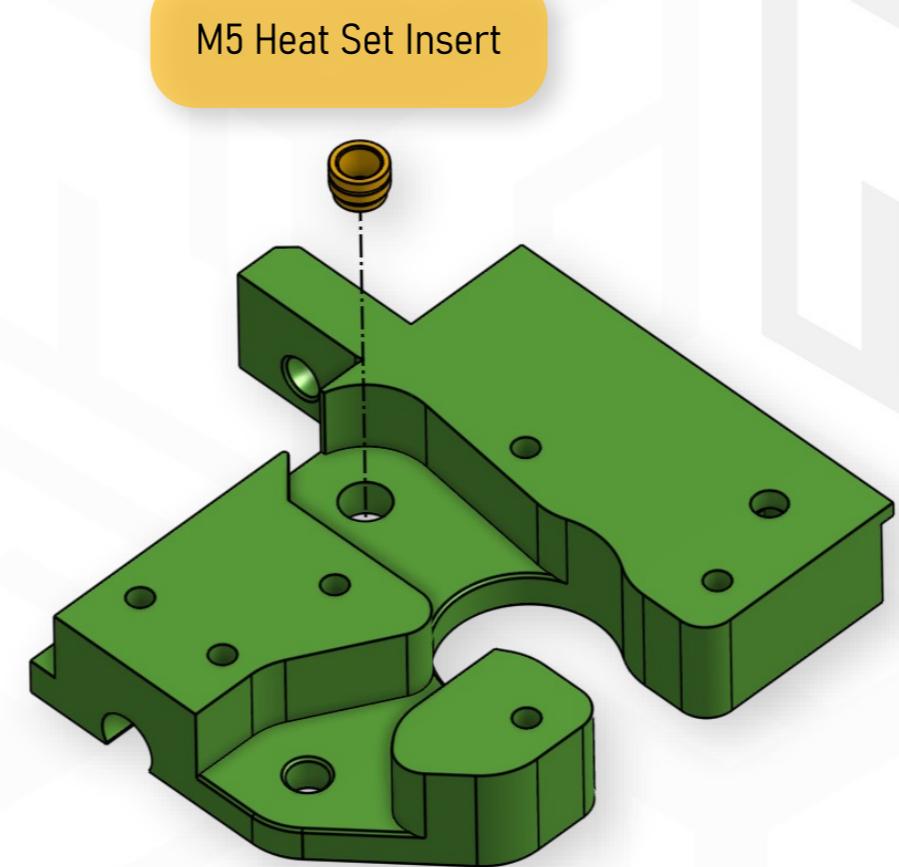
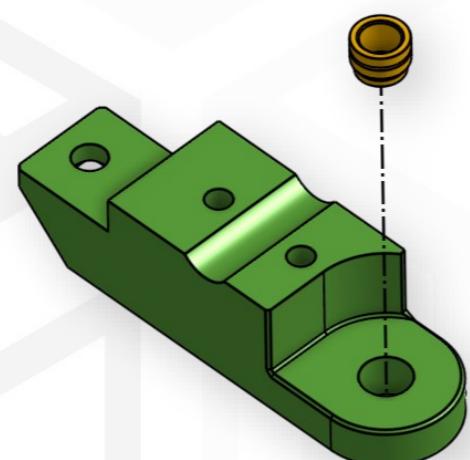
## HEAT SET INSERTS

### TIP: ENCLOSURE

The marked heat insert is used for installing the enclosure, so if you are not going to enclose the printer, you can choose not to install it.



M3 Heat Set Inserts



## TOOLS:

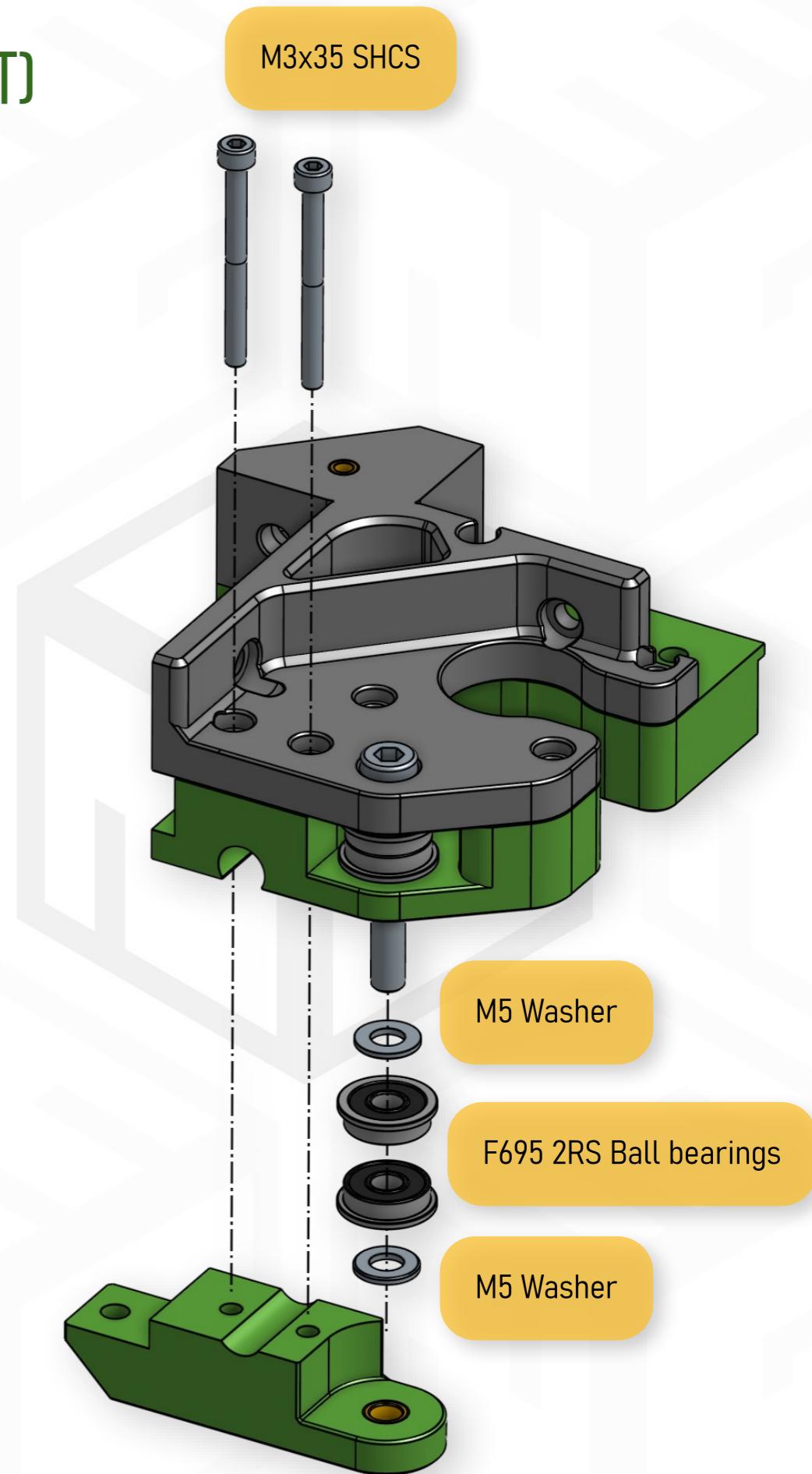
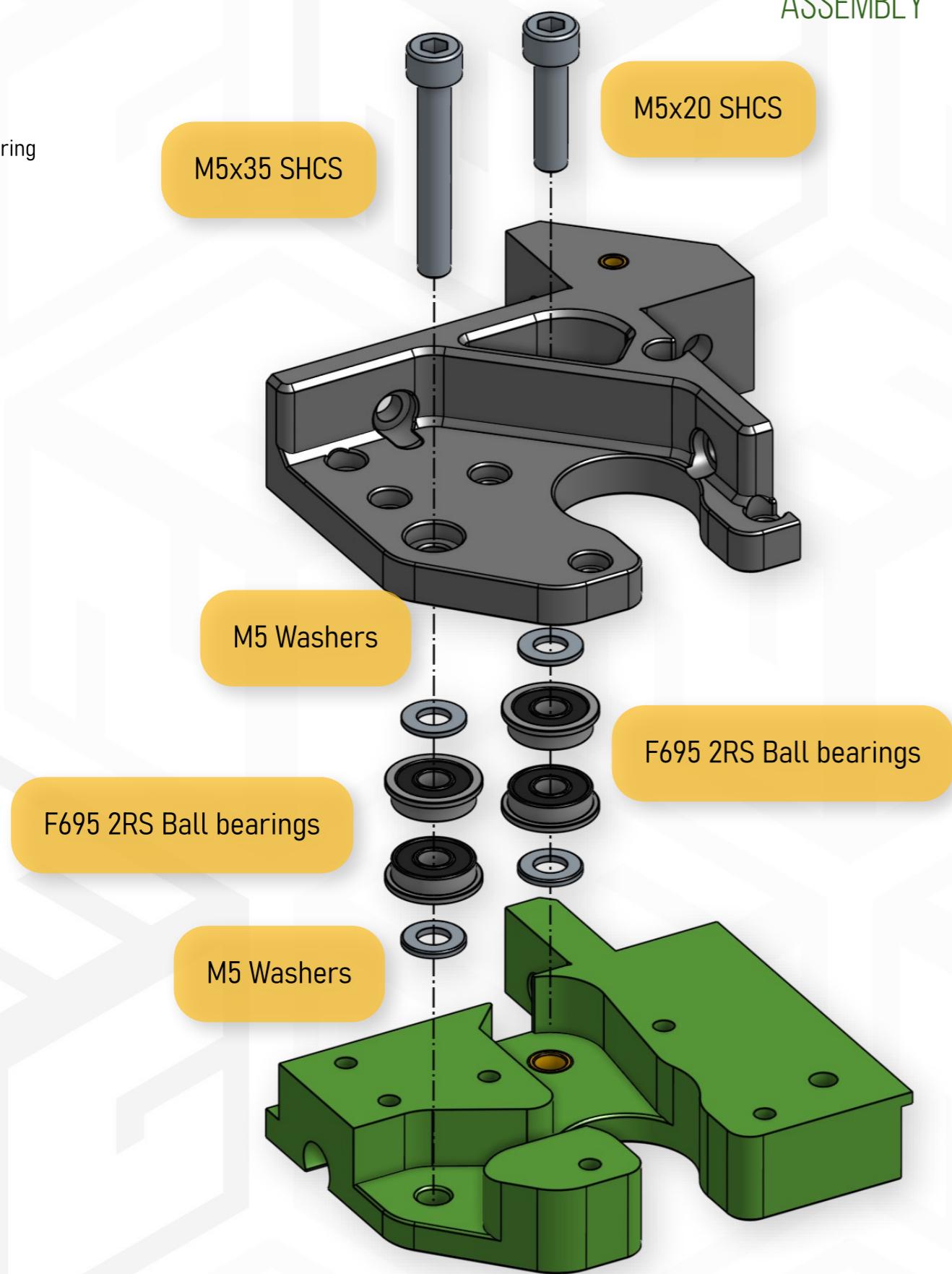
2.5 mm Allen key  
4 mm Allen key

## HARDWARE:

2x M3x35 SHCS  
1x M5x20 SHCS  
1x M5x35 SHCS  
  
6x M5 Washer  
  
6x F695 2RS Ball bearing

# TOP FRAME B STEPPER MOTOR MOUNT (LEFT)

## ASSEMBLY



TOOLS:

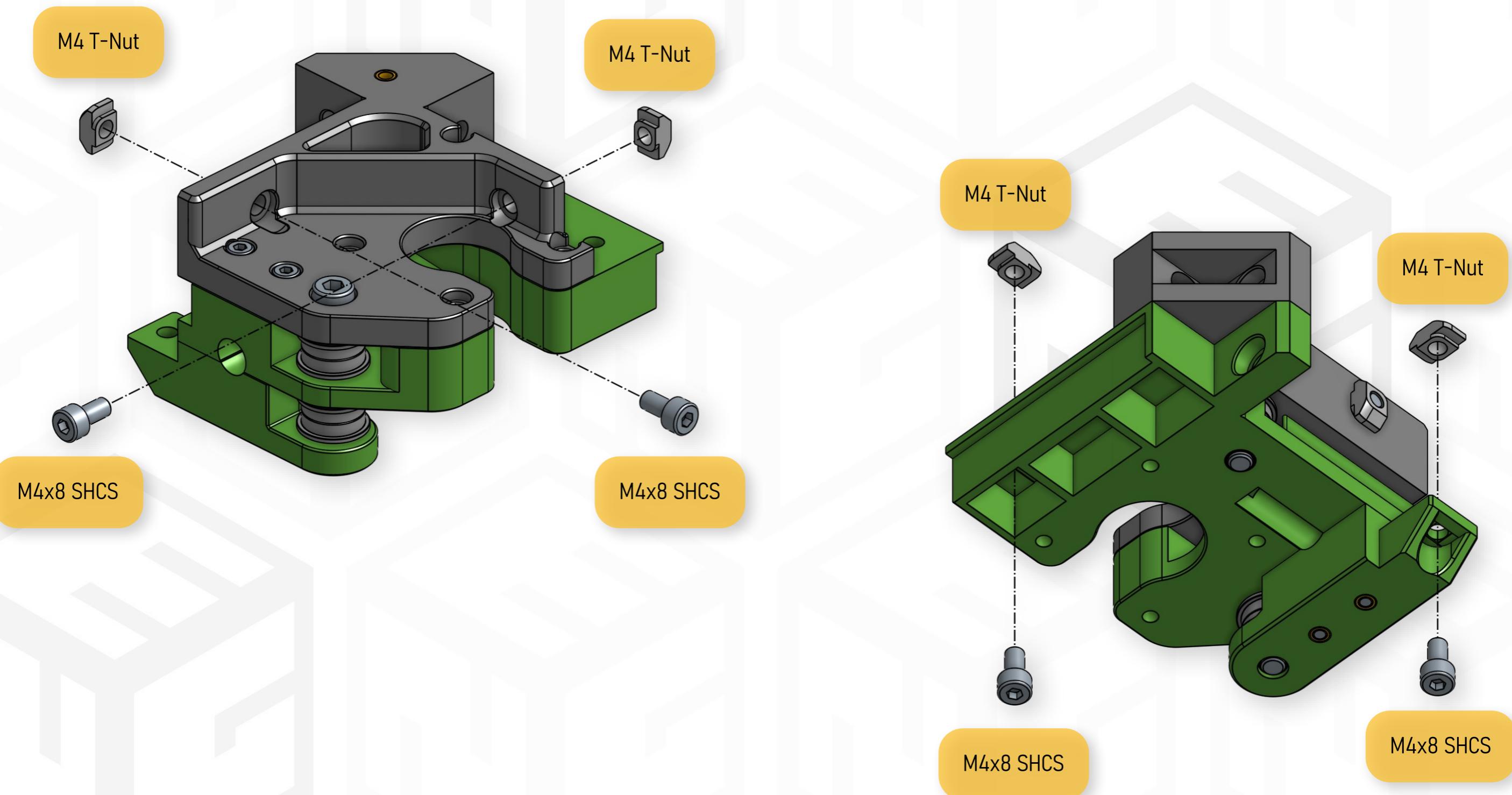
3 mm Allen key

HARDWARE:

4x M4x8 SHCS

4x M4 T-Nut

TOP FRAME  
B STEPPER MOTOR MOUNT (LEFT)



**TOOLS:**

Heat set insert press

**HARDWARE:**

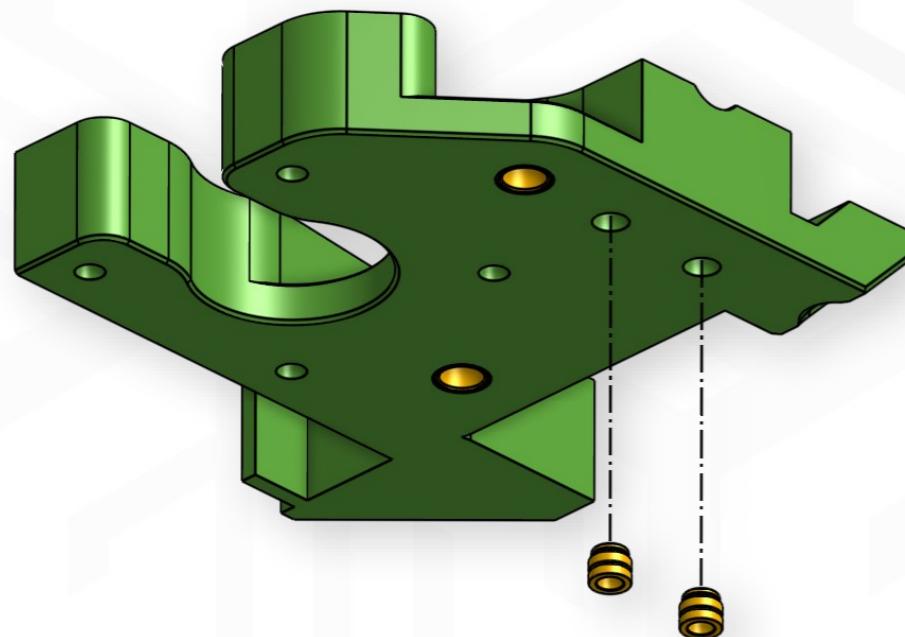
3x M3 Heat set insert  
2x M5 Heat set insert

**PRINTED PARTS:**

frame\_top\_rear\_A\_right\_middle.stl  
frame\_top\_rear\_A\_right\_bottom.stl

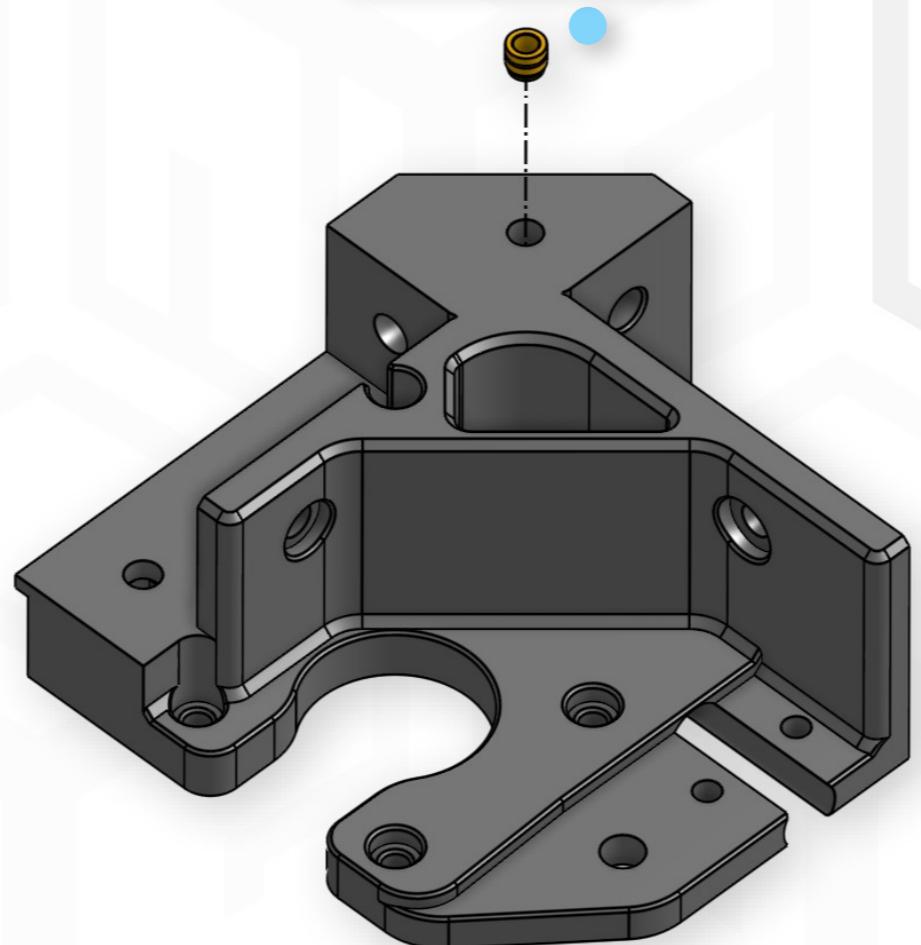
# TOP FRAME A STEPPER MOTOR MOUNT (RIGHT)

## HEAT SET INSERTS



M3 Heat Set Inserts

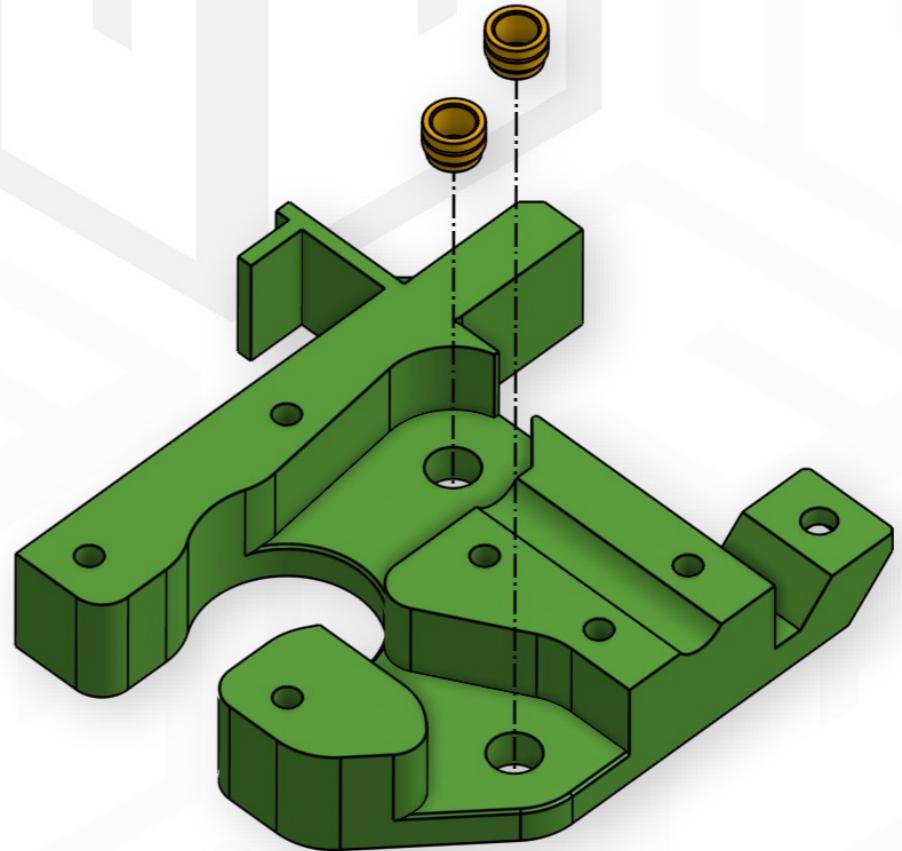
M3 Heat Set Insert



## TIP: ENCLOSURE

The marked heat insert is used for installing the enclosure, so if you are not going to enclose the printer, you can choose not to install it.

M5 Heat Set Inserts



## TOOLS:

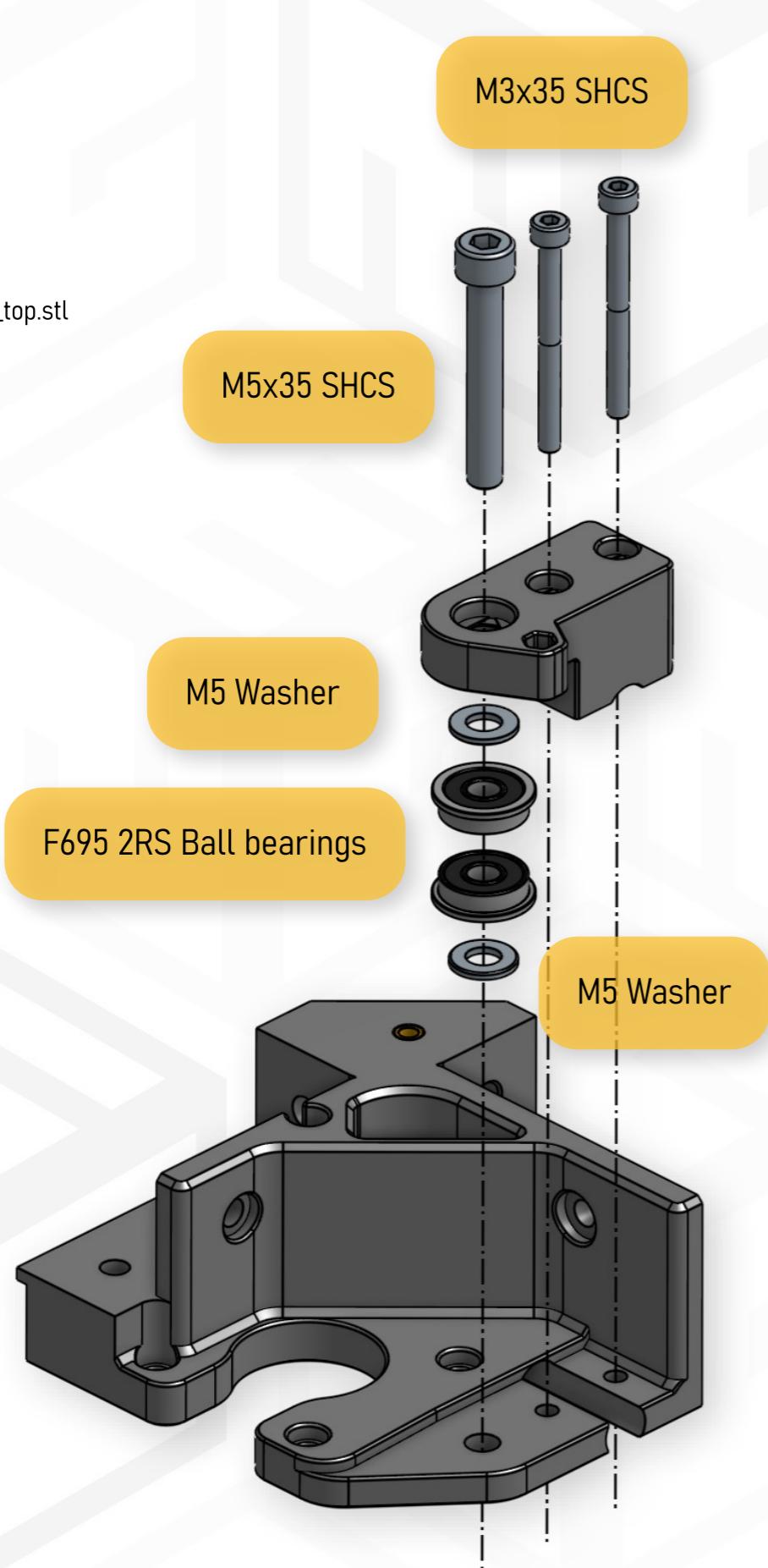
2.5 mm Allen key  
4 mm Allen key

## HARDWARE:

2x M3x35 SHCS  
1x M5x20 SHCS  
1x M5x35 SHCS  
  
6x M5 Washer  
  
6x F695 2RS Ball bearing

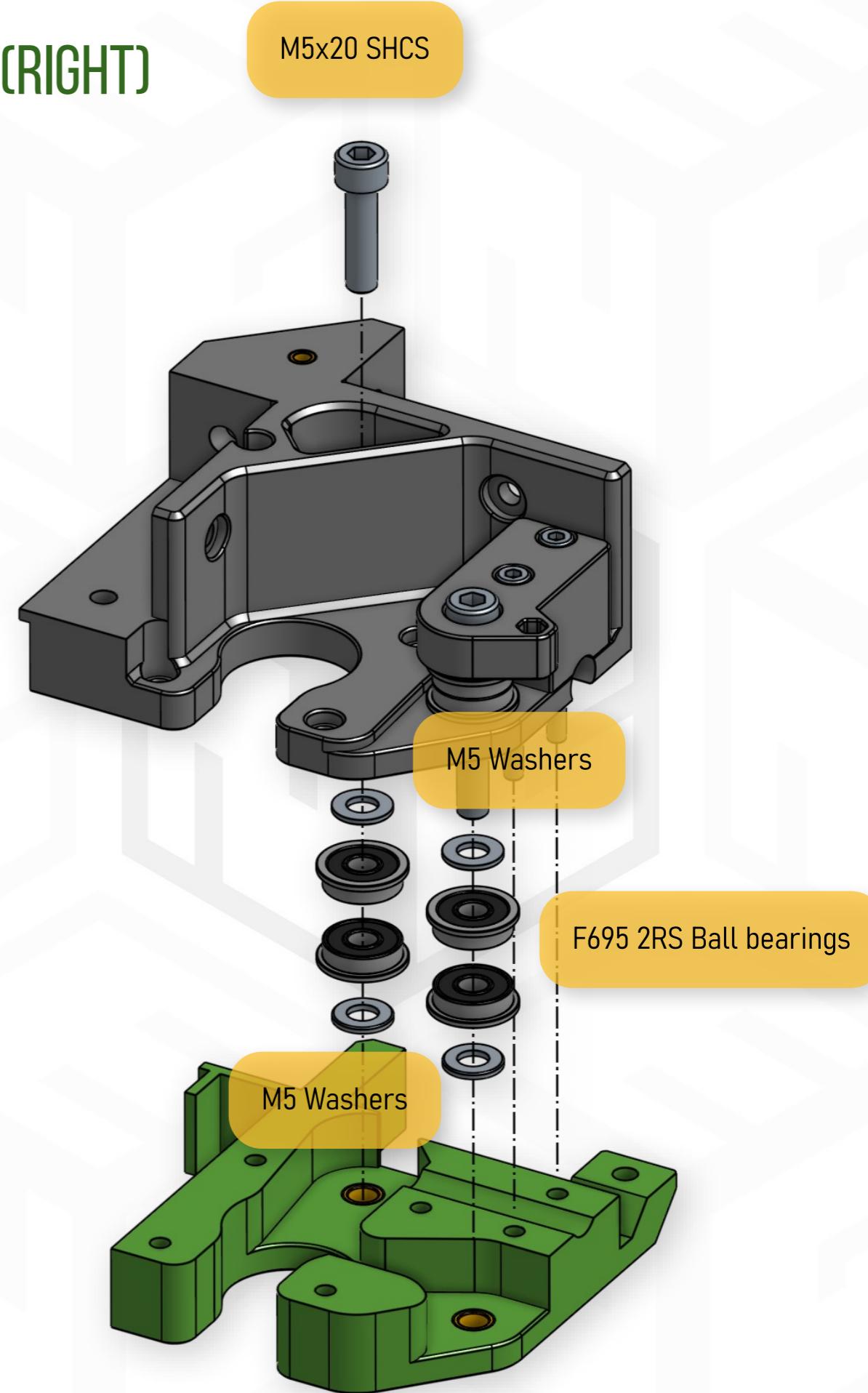
## PRINTED PARTS:

frame\_top\_rear\_A\_right\_top.stl



# TOP FRAME A STEPPER MOTOR MOUNT (RIGHT)

## ASSEMBLY



TOOLS:

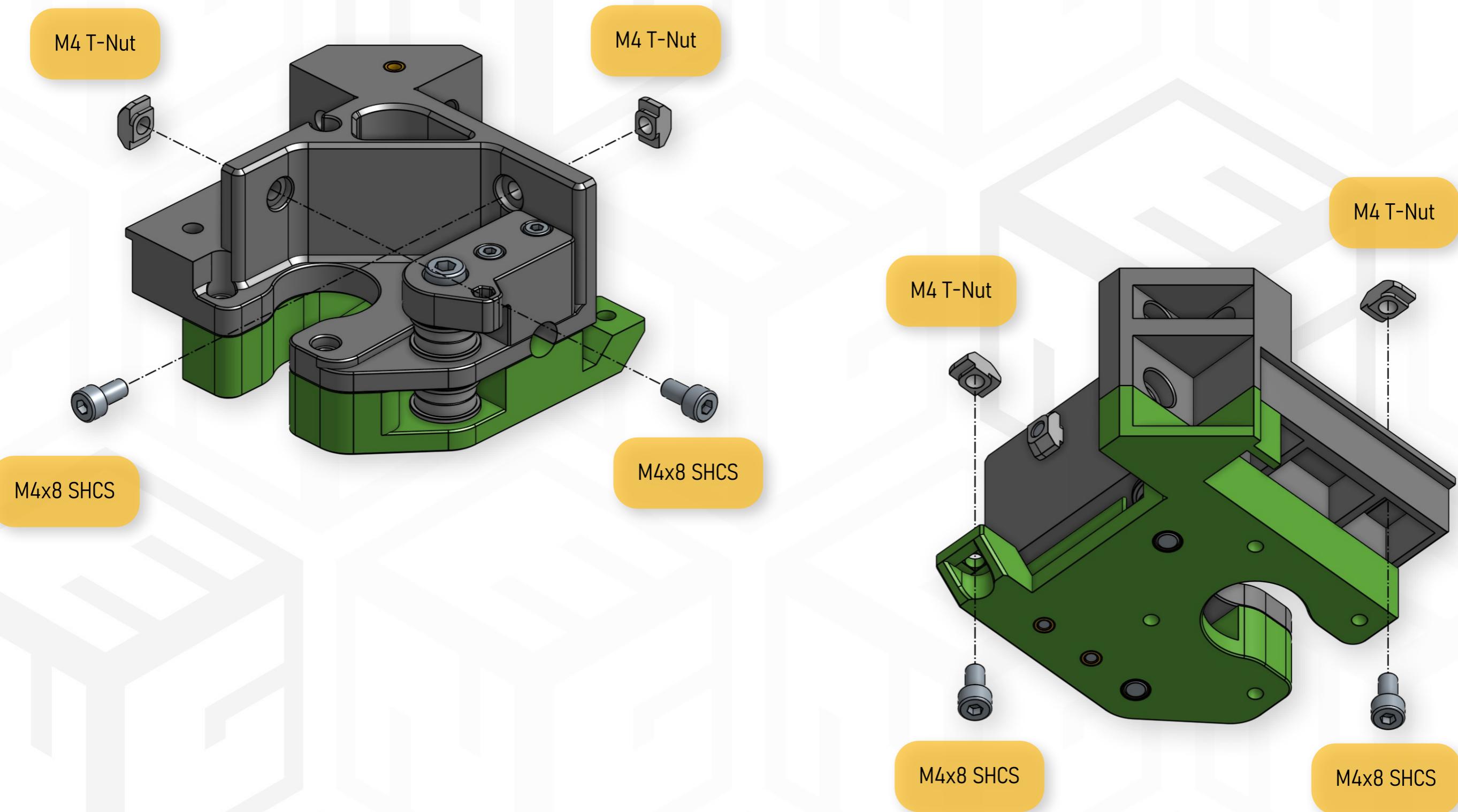
3 mm Allen key

HARDWARE:

4x M4x8 SHCS

4x M4 T-Nut

# TOP FRAME A STEPPER MOTOR MOUNT (RIGHT)



## TOOLS:

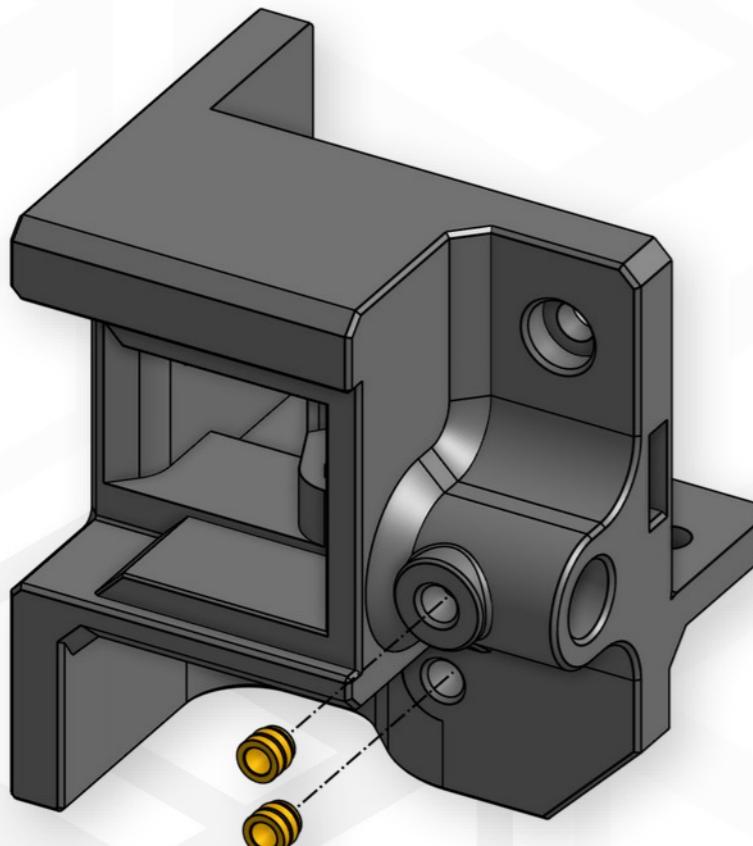
Heat set insert press

## HARDWARE:

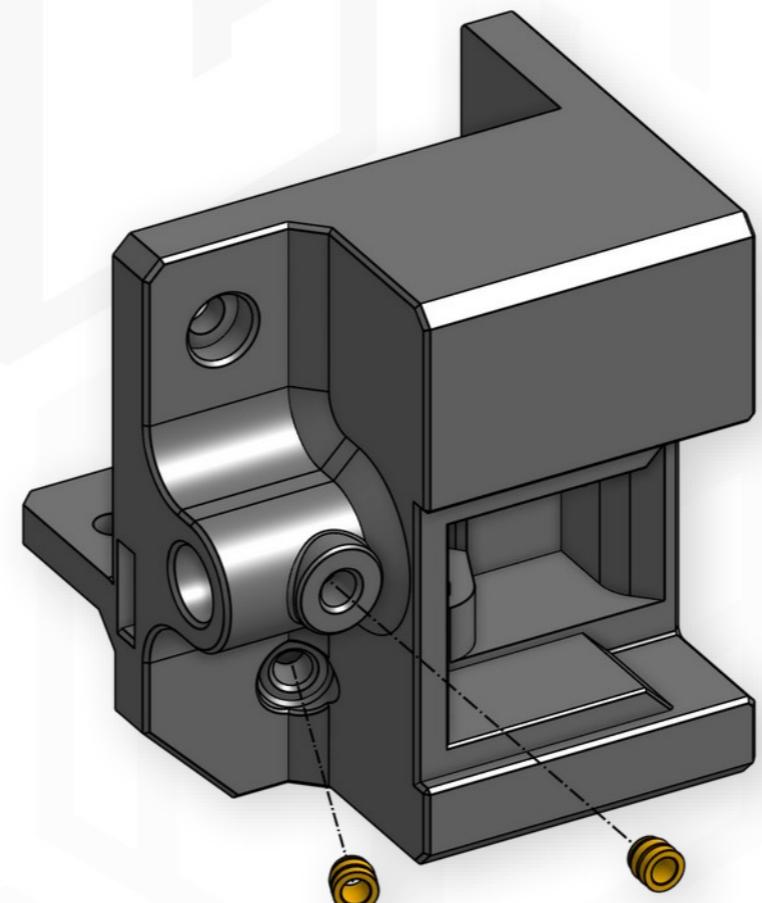
6x M3 Heat set insert  
2x M5 Heat set insert

## PRINTED PARTS:

frame\_top\_front\_left\_body.stl  
frame\_top\_front\_left\_tensioner.stl  
frame\_top\_front\_right\_body.stl  
frame\_top\_front\_right\_tensioner.stl



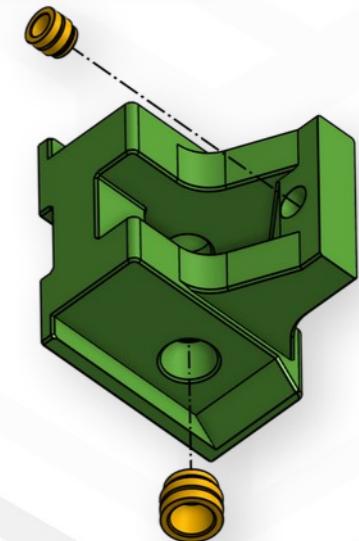
M3 Heat Set Inserts



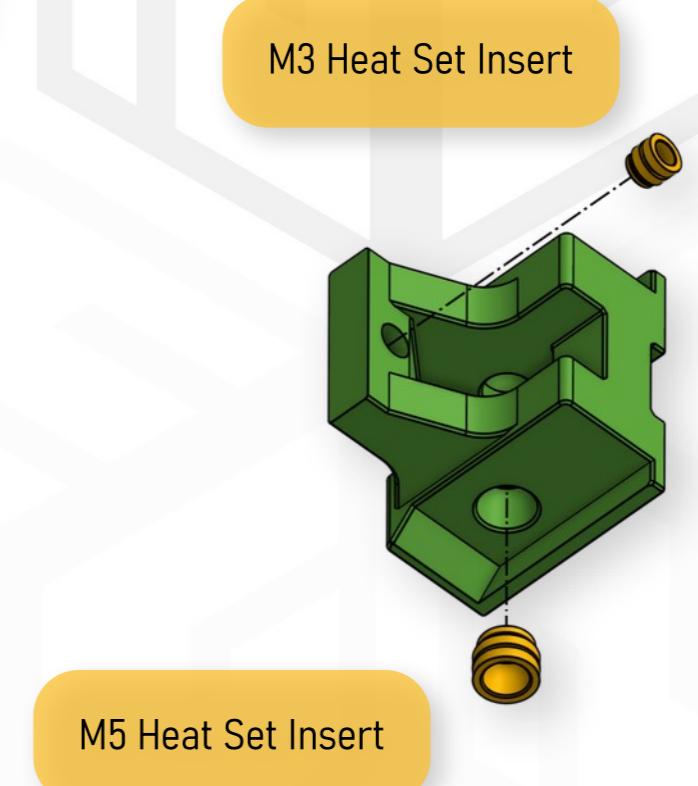
# TOP FRAME FRONT CORNERS

## HEAT SET INSERTS

M3 Heat Set Insert



M5 Heat Set Insert



## TOOLS:

1.5 mm Allen key  
2.5 mm Allen key  
3 mm Allen key  
4 mm Allen key

## HARDWARE:

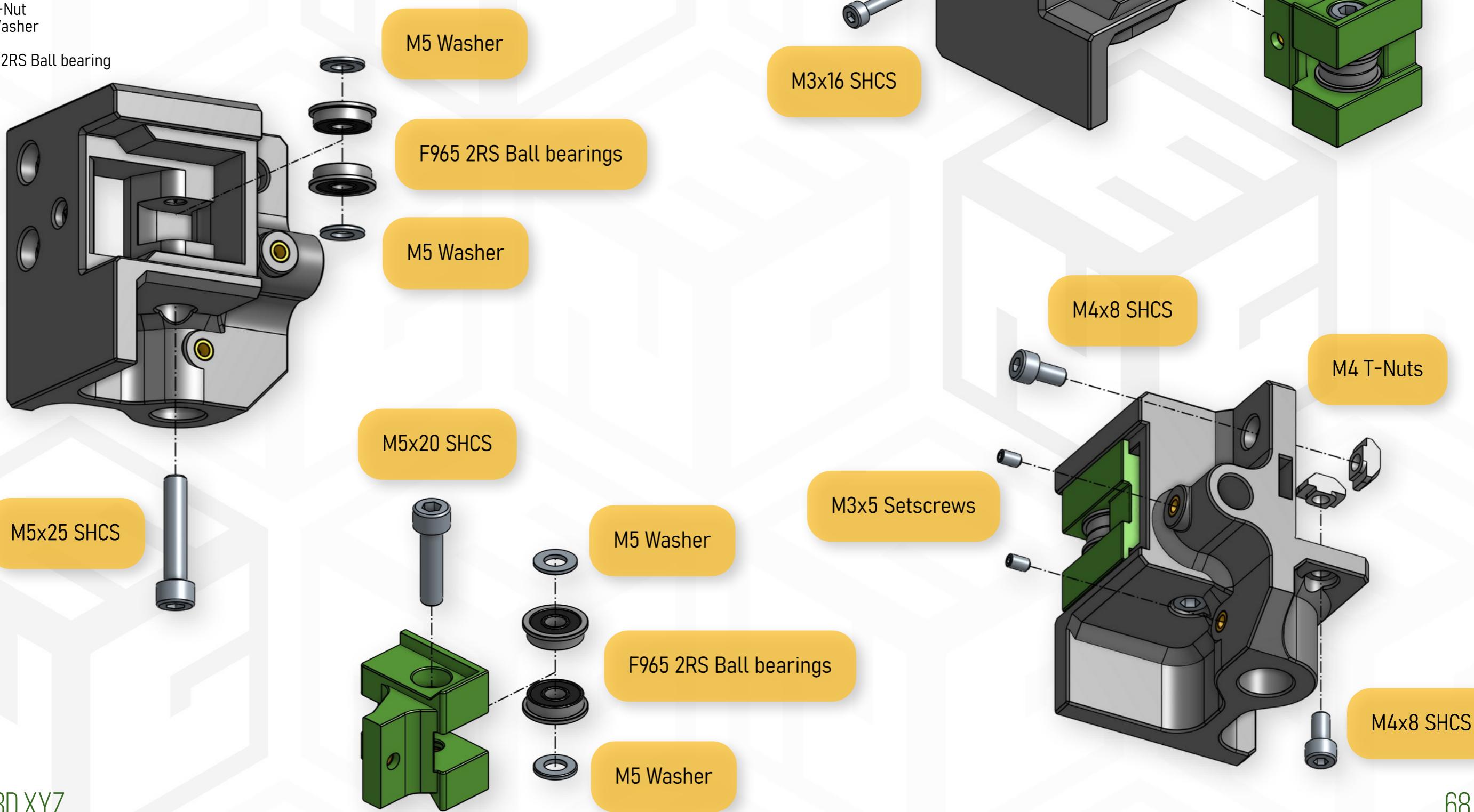
2x M3x5 setscrew  
1x M3x16 SHCS  
2x M4x8 SHCS  
1x M5x20 SHCS  
1x M5x25 SHCS

2x M4 T-Nut  
4x M5 Washer

4x F695 2RS Ball bearing

# TOP FRAME FRONT CORNERS

## LEFT ASSEMBLY



## TOOLS:

1.5 mm Allen key  
2.5 mm Allen key  
3 mm Allen key  
4 mm Allen key

## HARDWARE:

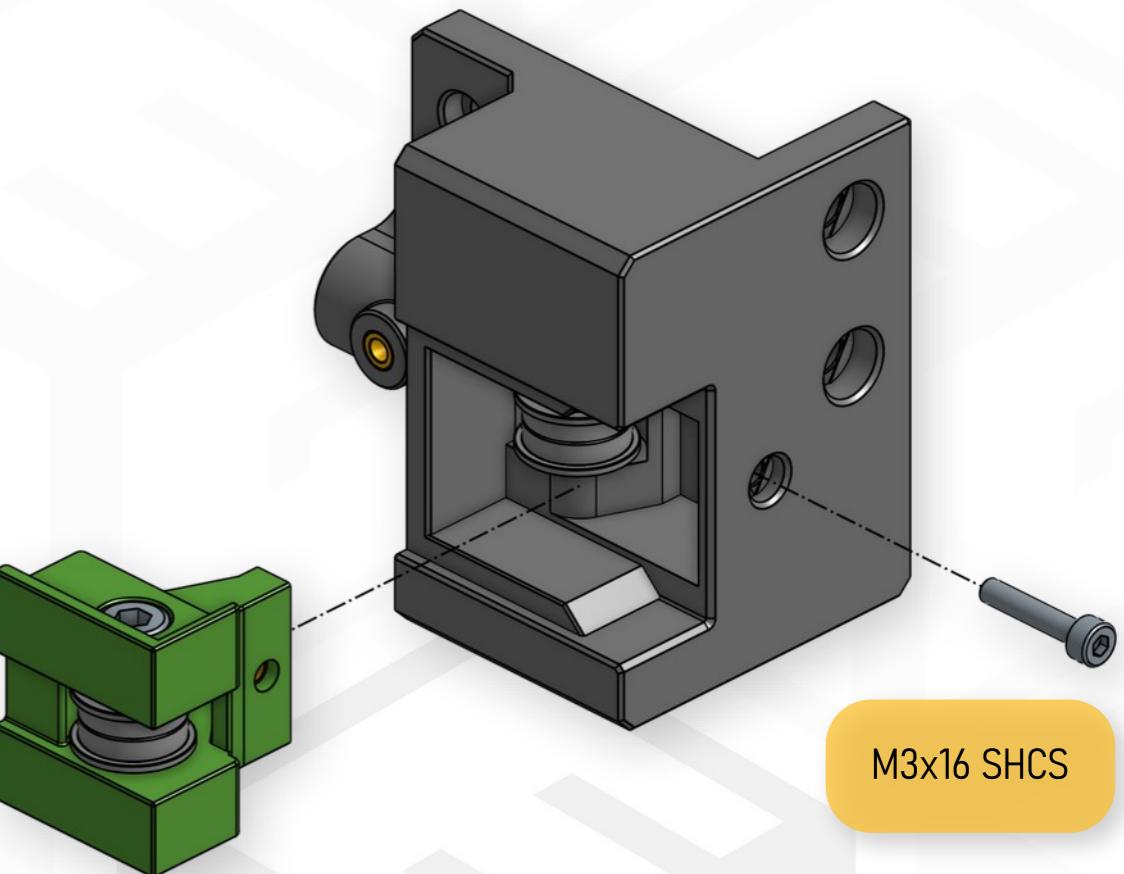
2x M3x5 setscrew  
1x M3x16 SHCS  
2x M4x8 SHCS  
1x M5x20 SHCS  
1x M5x25 SHCS

2x M4 T-Nut  
4x M5 Washer

4x F695 2RS Ball bearing

# TOP FRAME FRONT CORNERS

## RIGHT ASSEMBLY

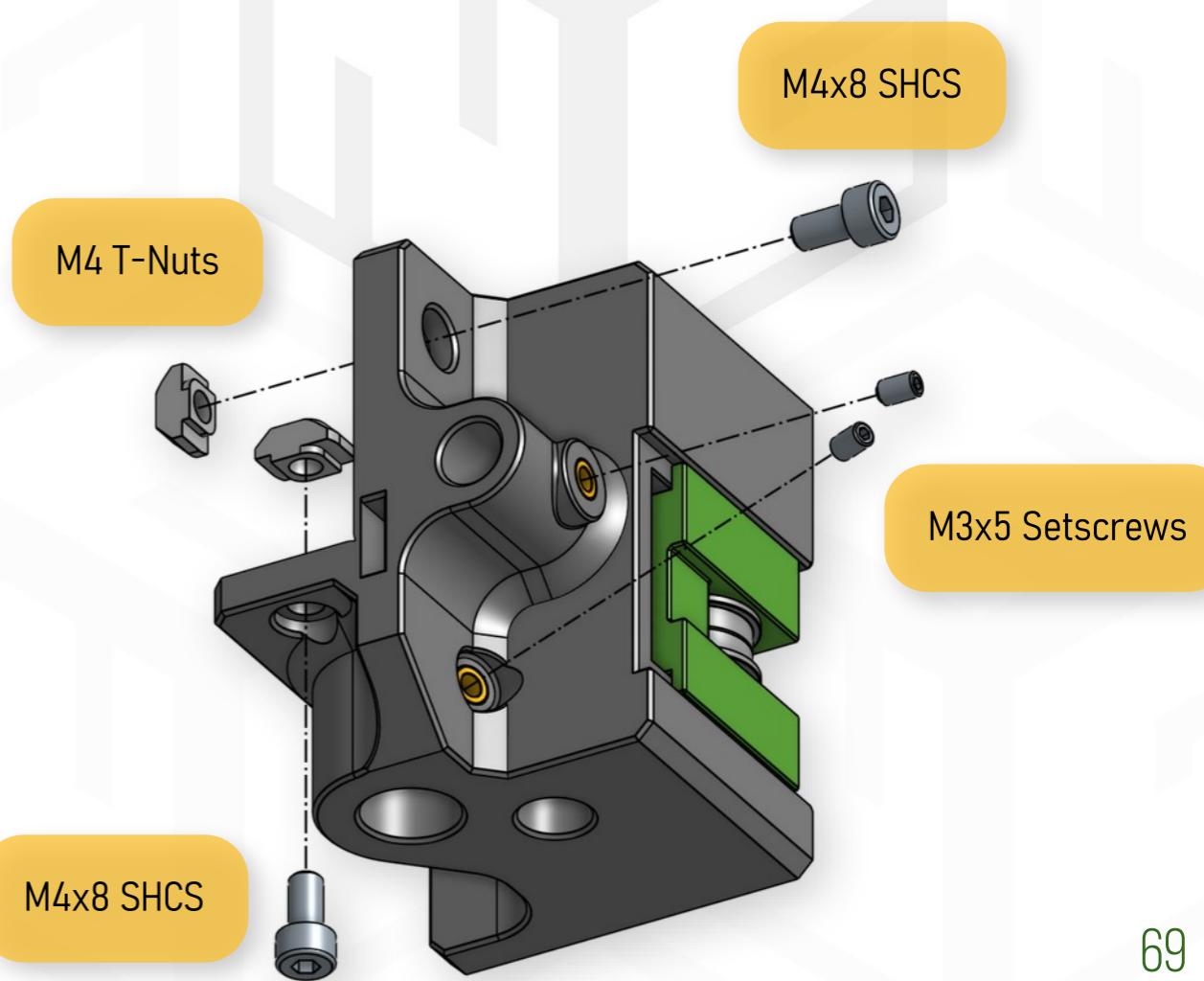
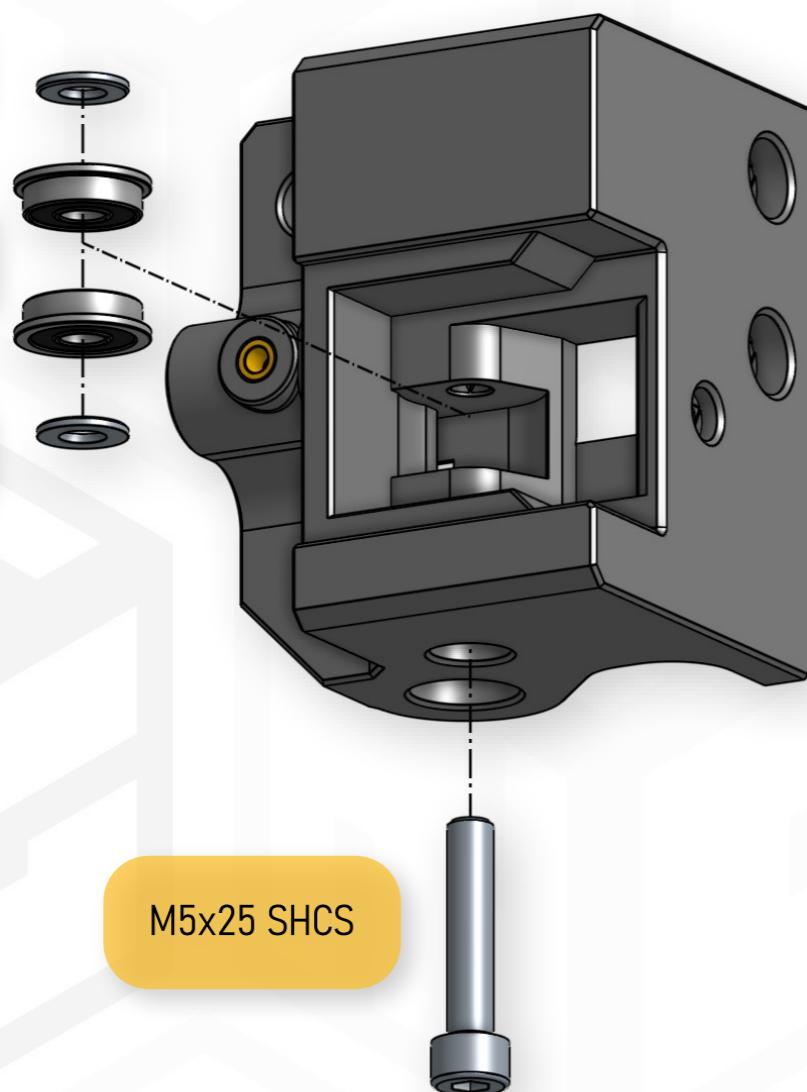


M5 Washer

F965 2RS Ball bearings

M5 Washer

M5x25 SHCS



2 Z AXIS RODS

## TOP FRAME REAR COVER

### TOOLS:

Heat set insert press

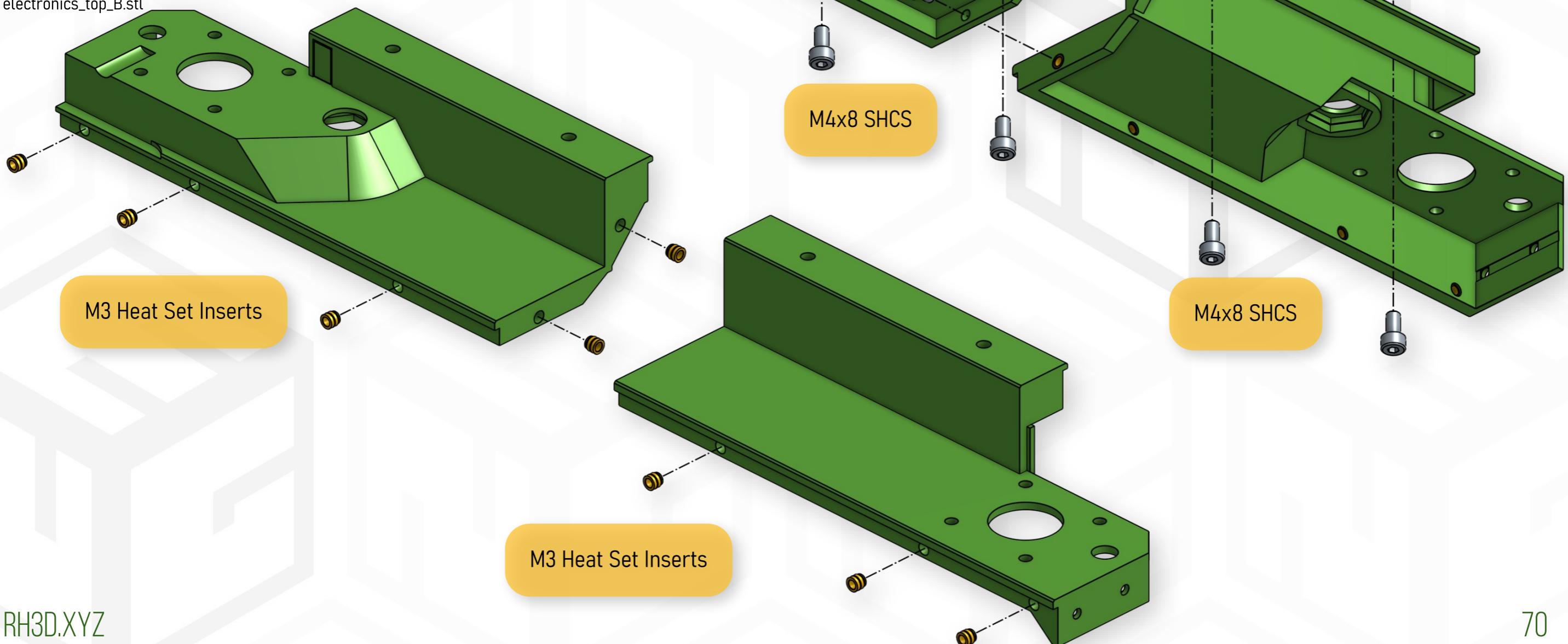
2.5 mm Allen key  
3 mm Allen key

### HARDWARE:

8x M3 Heat set insert  
2x M3x6 SHCS  
4x M4x8 SHCS  
4x M4 T-Nut

### PRINTED PARTS:

electronics\_top\_A.stl  
electronics\_top\_B.stl



**WARNING: PRINT QUALITY**  
Check the print quality in areas where stepper motors will be installed.  
If you find any blobs, significant overextrusion or warping, you should clean it off, otherwise, it might be too hard to install the stepper motors, especially with cooling.

**WARNING: REMOVE SUPPORT**  
Break off the built-in 2 supports marked with ✗.

3 Z AXIS RODS

# TOP FRAME REAR COVER

## TOOLS:

Heat set insert press

2.5 mm Allen key  
3 mm Allen key

## HARDWARE:

- 8x M3 Heat set insert
- 2x M3x6 SHCS
- 7x M4x8 SHCS
- 7x M4 T-Nut

## PRINTED PARTS:

electronics\_top\_A.stl  
electronics\_top\_B\_triple.stl

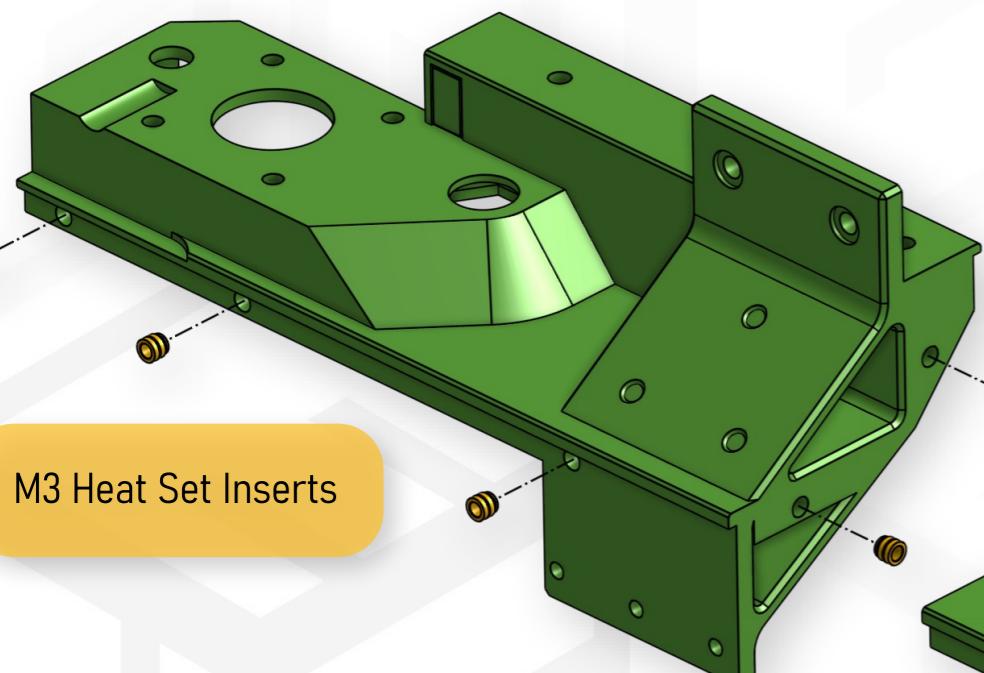
M4 T-Nuts

M4 T-Nuts

M3x6 SHCS

M4x8 SHCS

M4 T-Nuts

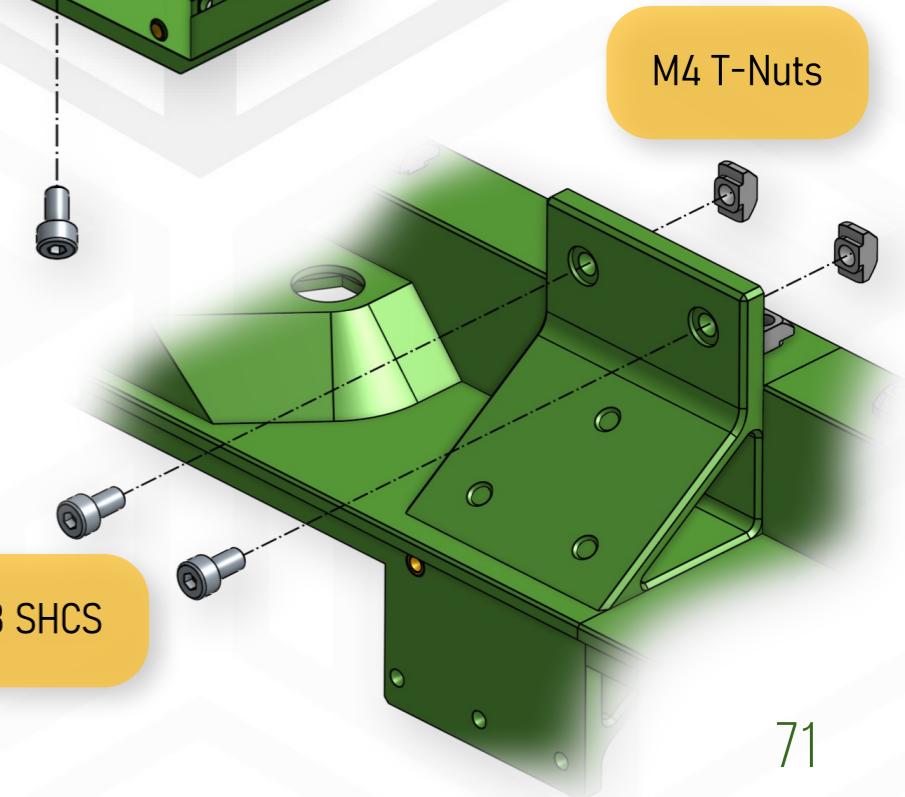
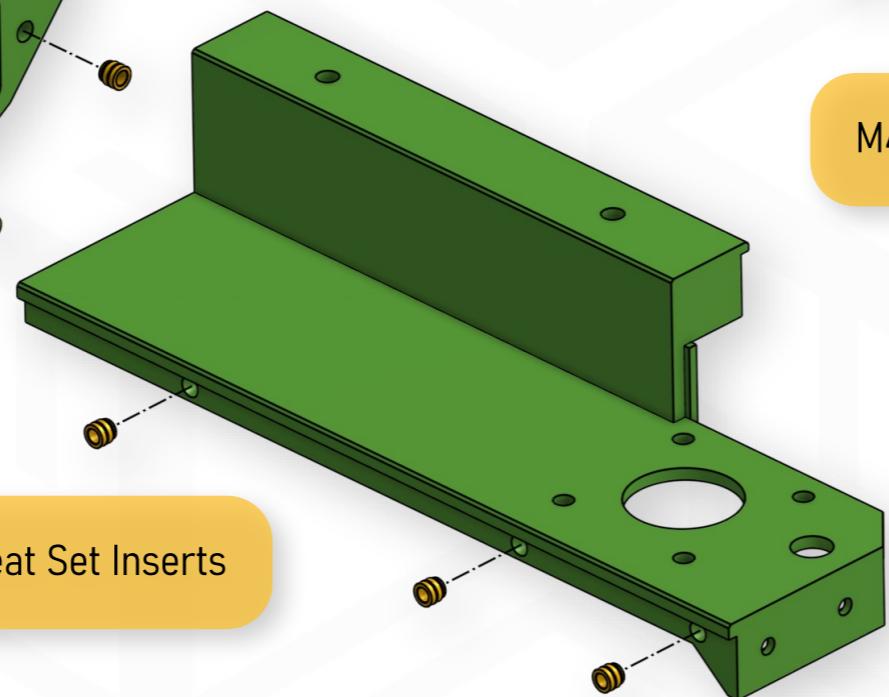


M3 Heat Set Inserts

M3 Heat Set Inserts

M4x8 SHCS

M4x8 SHCS



## WARNING: PRINT QUALITY

Check the print quality in areas where stepper motors will be installed. If you find any blobs, significant overextrusion or warping, you should clean it off, otherwise, it might be too hard to install the stepper motors, especially with cooling.

## WARNING: REMOVE SUPPORT

Break off the built-in 2 supports marked with X.

TOOLS:

3 mm Allen key

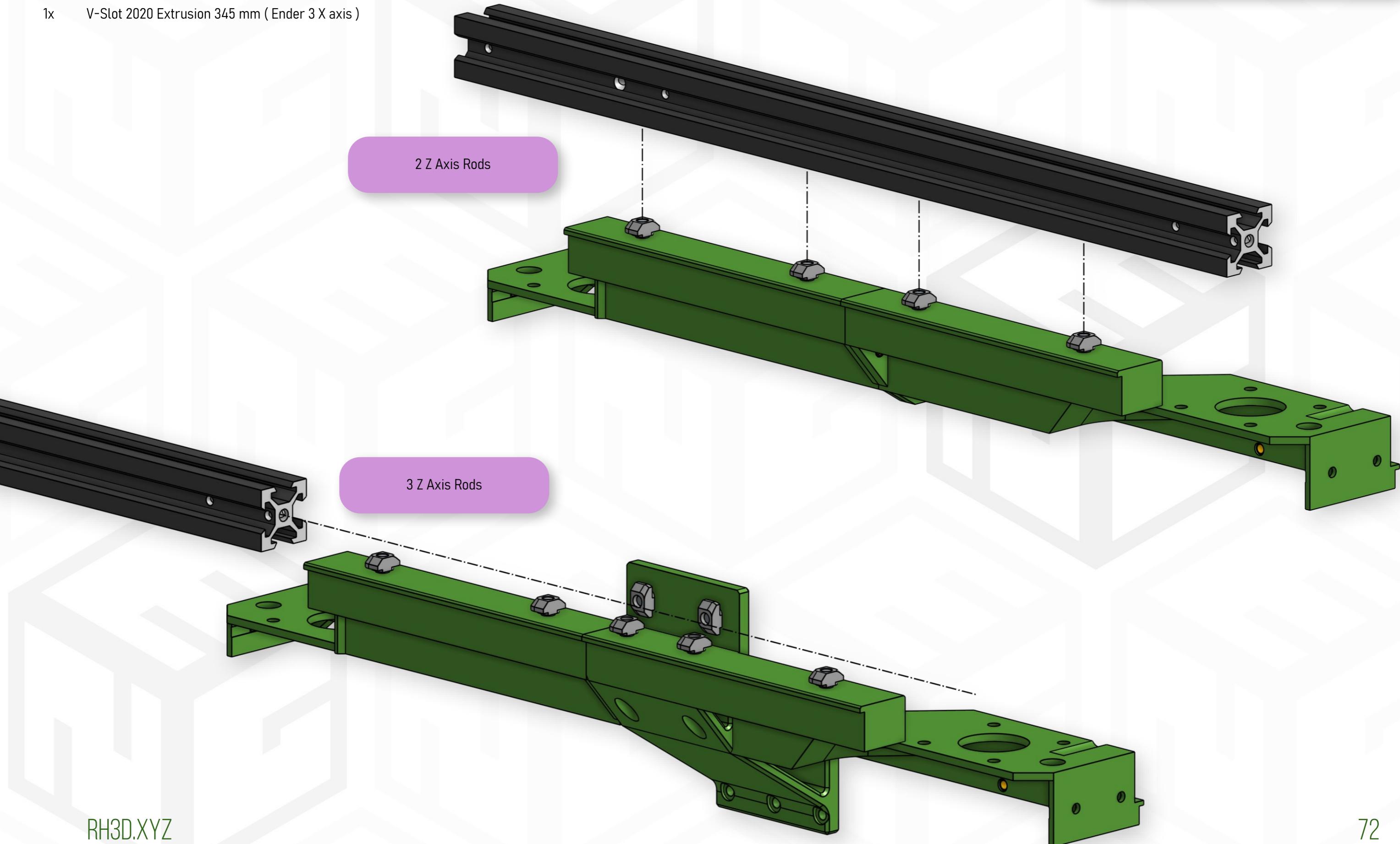
HARDWARE:

1x V-Slot 2020 Extrusion 345 mm (Ender 3 X axis)

# TOP FRAME REAR COVER

TIP: ORIENTATION

Orientation of the 2020 extrusion is not important.



## TOOLS:

3 mm Allen key  
4 mm Allen key

## HARDWARE:

- 6x M5x12 SHCS
- 4x M5x10 BHCS ( Only for non printed frame )
- 4x M5 Washer ( Only for non printed frame )
- 2x V-Slot 2040 Extrusion 400 mm ( Ender 3 Z axis )

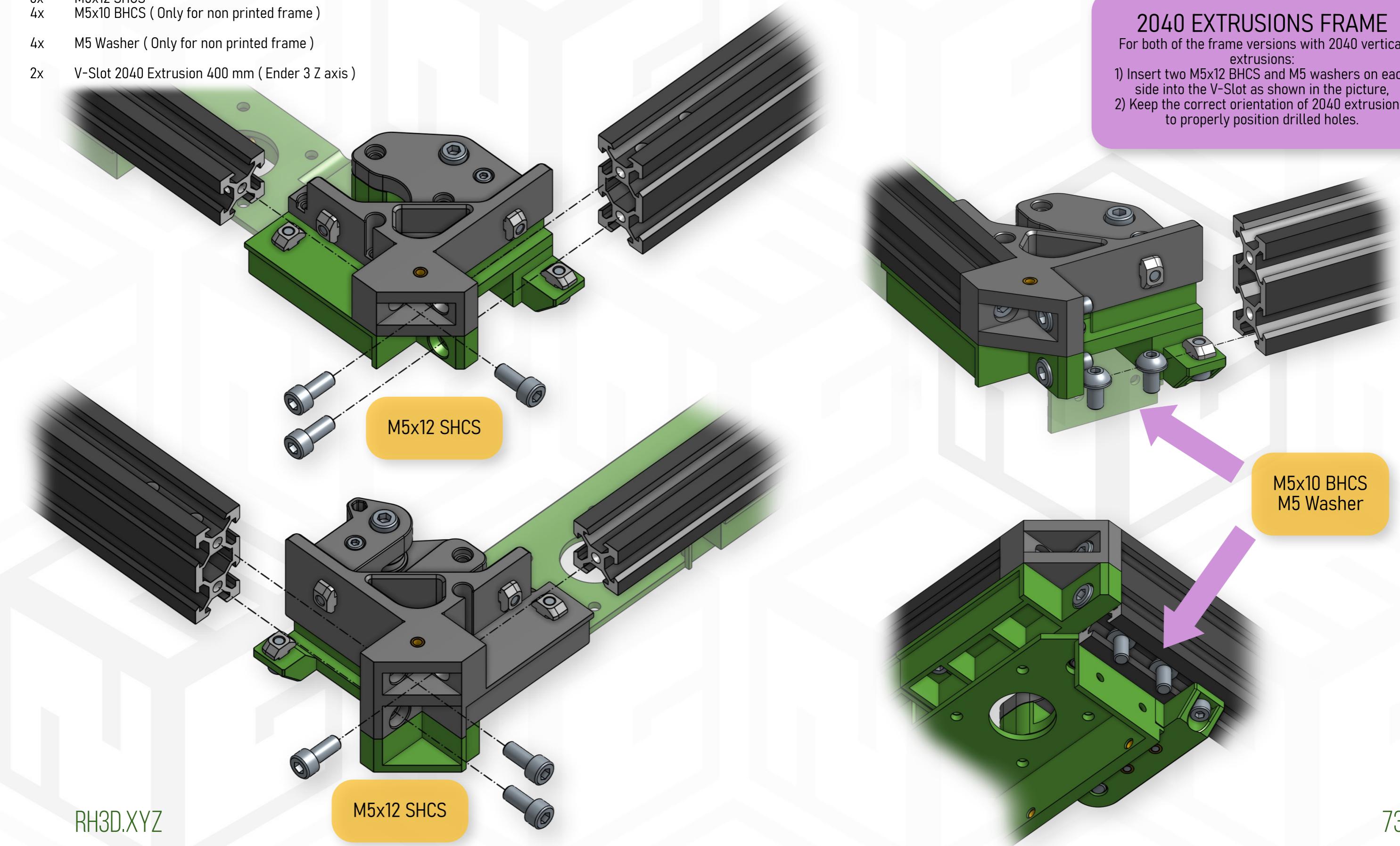
# TOP FRAME ASSEMBLY

**PRINTED FRAME VERTICALS**  
Orientation of both 2040 V-Slot extrusions is not important.

## 2040 EXTRUSIONS FRAME

For both of the frame versions with 2040 vertical extrusions:

- 1) Insert two M5x12 BHCS and M5 washers on each side into the V-Slot as shown in the picture,
- 2) Keep the correct orientation of 2040 extrusions to properly position drilled holes.



## SQUARING PROCEDURE

This process is highly dependent on the quality of your preparation and calibration before printing parts, where one of the key steps would be skew and shrinkage calibration. With perfect parts, you should need to do basically no squaring, but nothing is perfect, right?

In the squaring procedure we will be comparing the top frame measurements ( $W_1$ ,  $W_2$ ,  $DA$ ,  $DB$ ) and adjusting the frame corner joints to get to the point where  $W_1=W_2$  (~407 mm) and  $DA=DB$  (~575 mm). To achieve it, we will be inserting thin shims (paper, tin can, thin plastic) in the right place between the printed parts and V-Slot extrusions.

To place the shim we will have primary ( $A_1$ ,  $B_1$ ) and secondary ( $A_2$ ,  $B_2$ ) positions on each side. Always prefer to use the primary position, unless your overall shim thickness is too high (~1 mm). In that situation you can start adding shims on the secondary position but if you need to do too much adjustment, you might consider reprinting parts after recalibrating your printer.

### WARNINGS:

It is crucial to perform this step without the XY gantry installed because it would affect the measurement.

Be consistent in the screw tightening force through the entire process and do not overtighten the M4 screws with T-Nuts because with excessive force you can start to deform the parts which can affect the measurement.

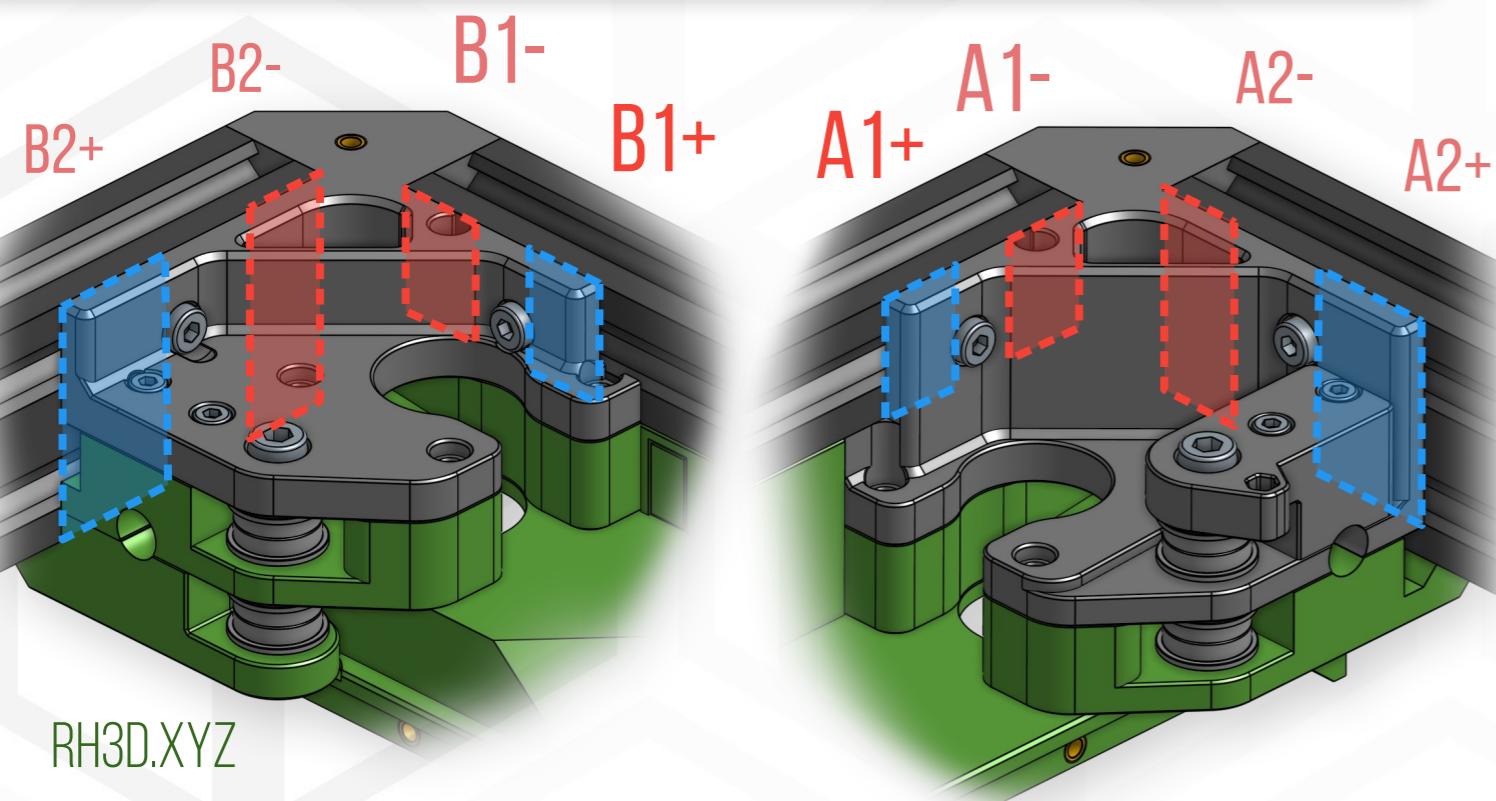
The top frame as is assembled in this step is still pretty flexible and it will reach its maximum stiffness after installing stepper motors and after joining it with the bottom frame and attaching the electronics panel.

### TIP: FLAT SURFACE

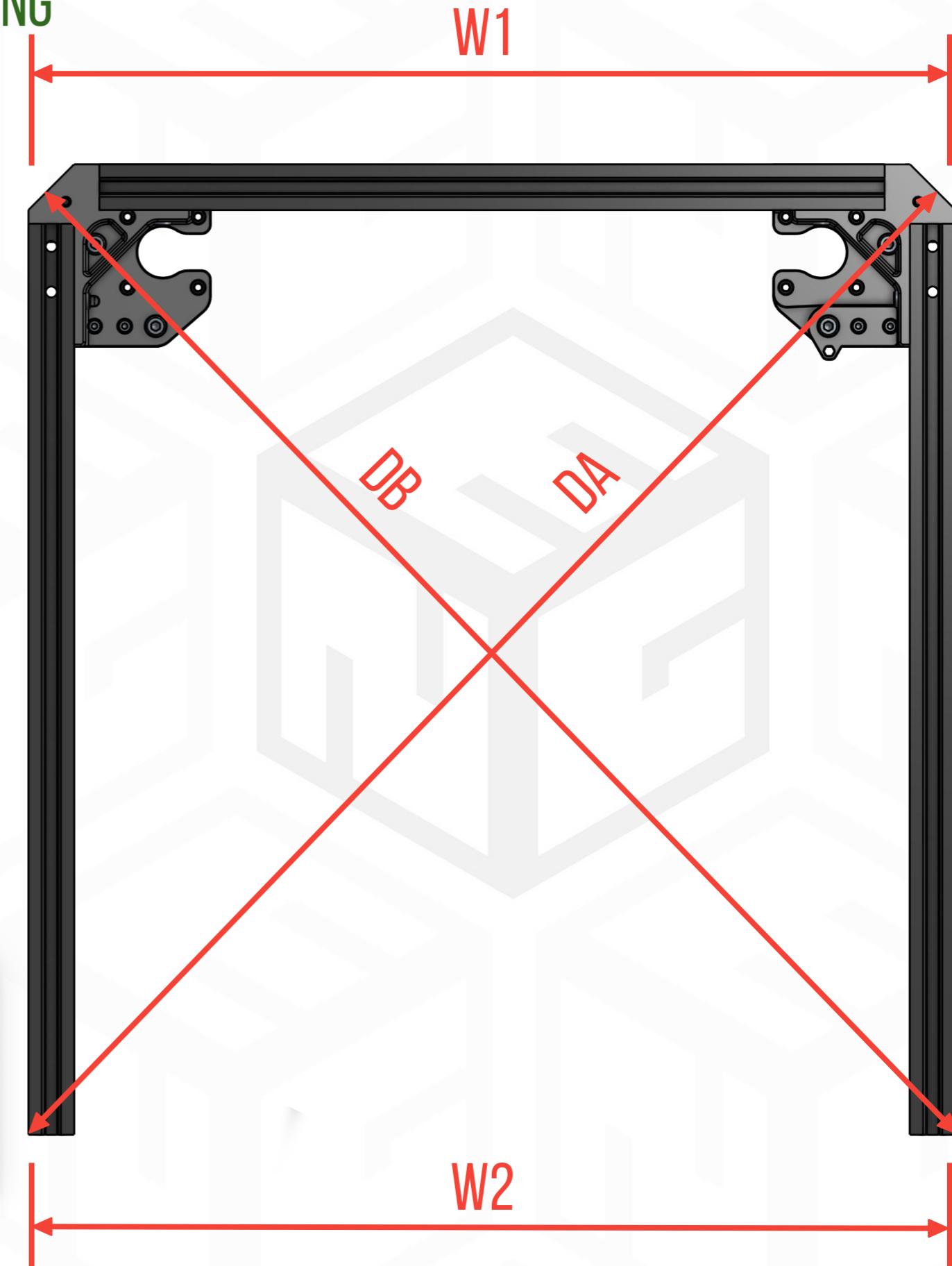
For measuring the dimensions, lay the frame upside down on a flat surface or support the 2040 extrusions on each end so you are sure the frame assembly is not twisted.

### TIP: SHIM POSITIONS

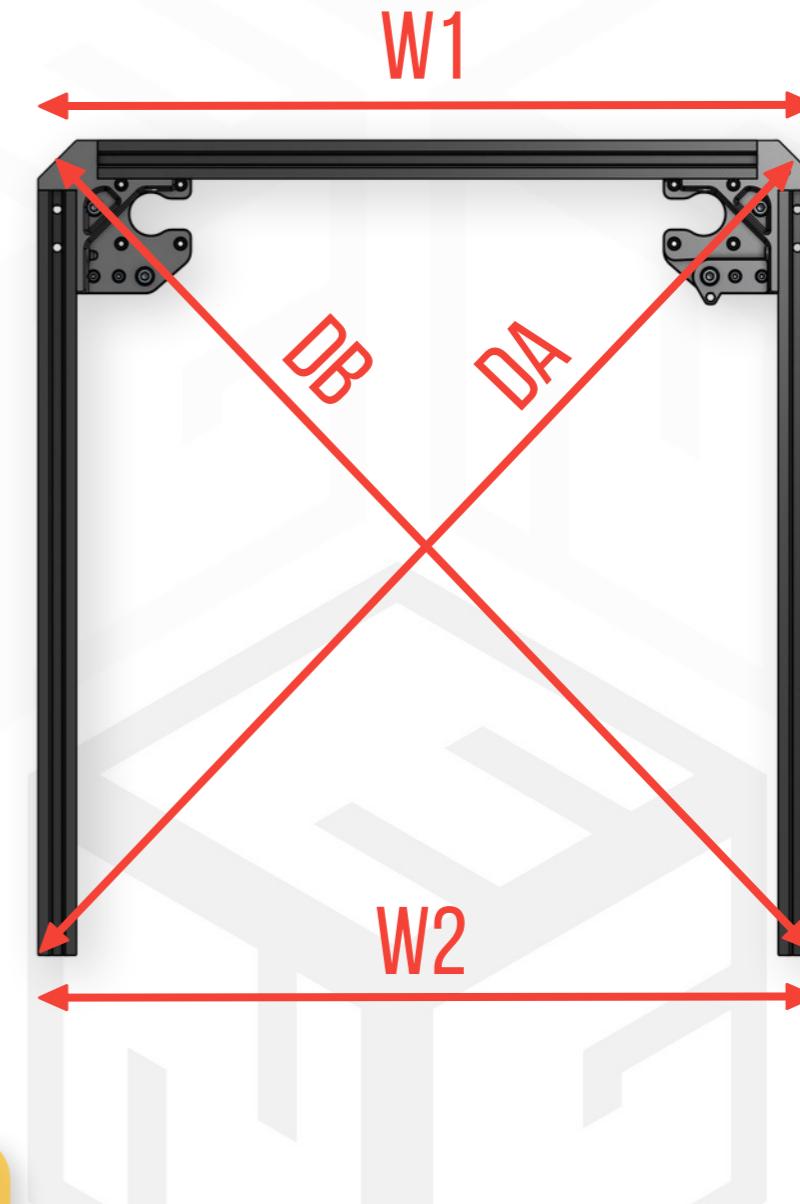
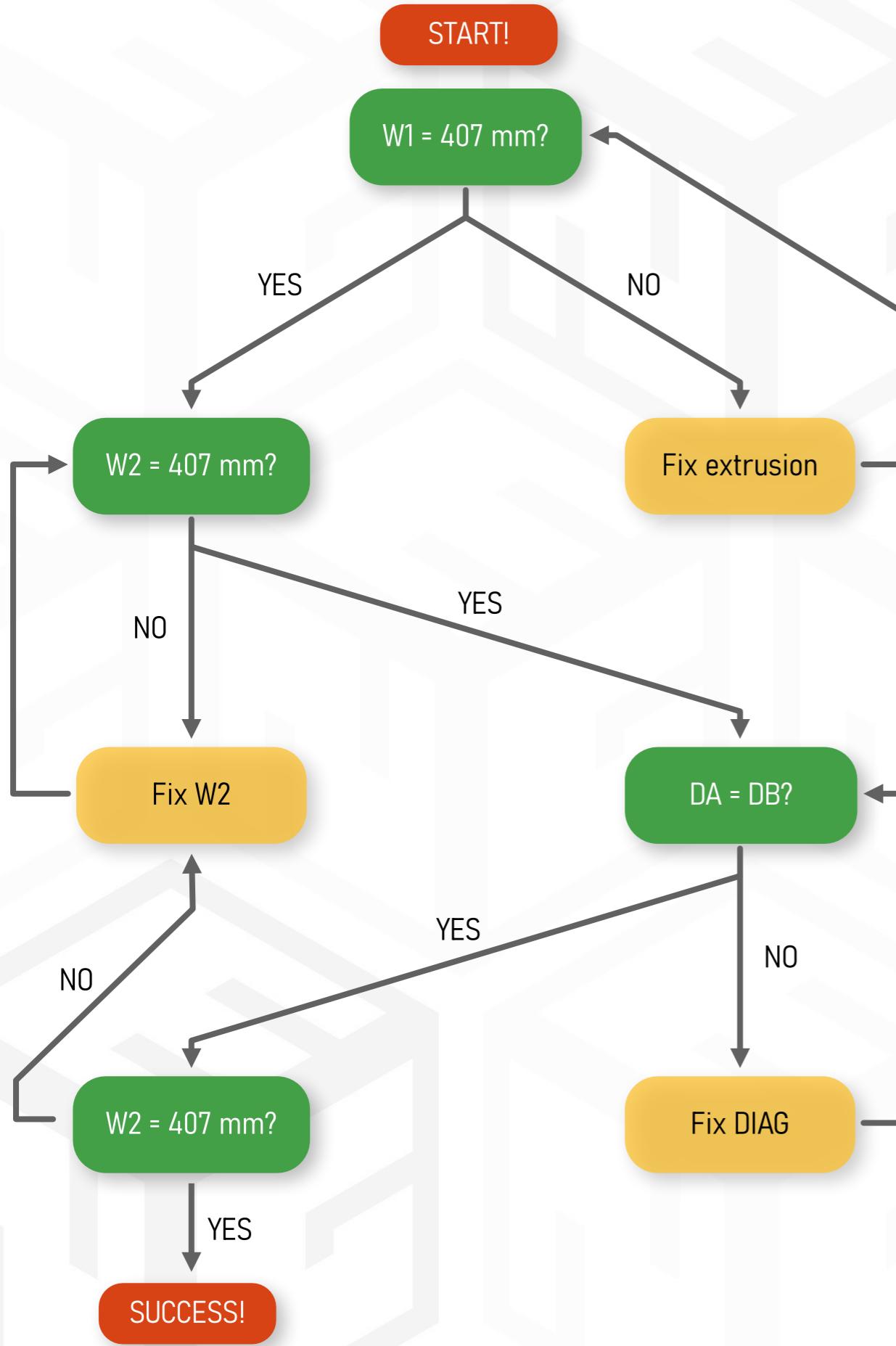
In majority of cases it is needed to only add shims to  $B_{1+}$  and  $A_{1+}$  positions so take that as your primary place to add shims and only if needed continue with other positions.



## TOP FRAME SQUARING



# TOP FRAME SQUARING



Fix extrusion

You didn't check the extrusion dimension before starting the build (follow page 3).

Fix W2

- To increase  $W_2$ , add shim to  $B1+$  and  $A1+$ .  
- To decrease  $W_2$ , remove shim from  $B1+$  and  $A1+$ , if can't, add shim to  $B1-$  and  $A1-$ .

Fix DIAG

- To increase  $DA$ , move shim from  $A1+$  to  $B1+$   
- To increase  $DB$ , move shim from  $B1+$  to  $A1+$

If necessary, you can substitute 1 by 2 in the previous steps (eg.  $B1+ = B2+$ ;  $A1- = A2-$ )

## TOOLS:

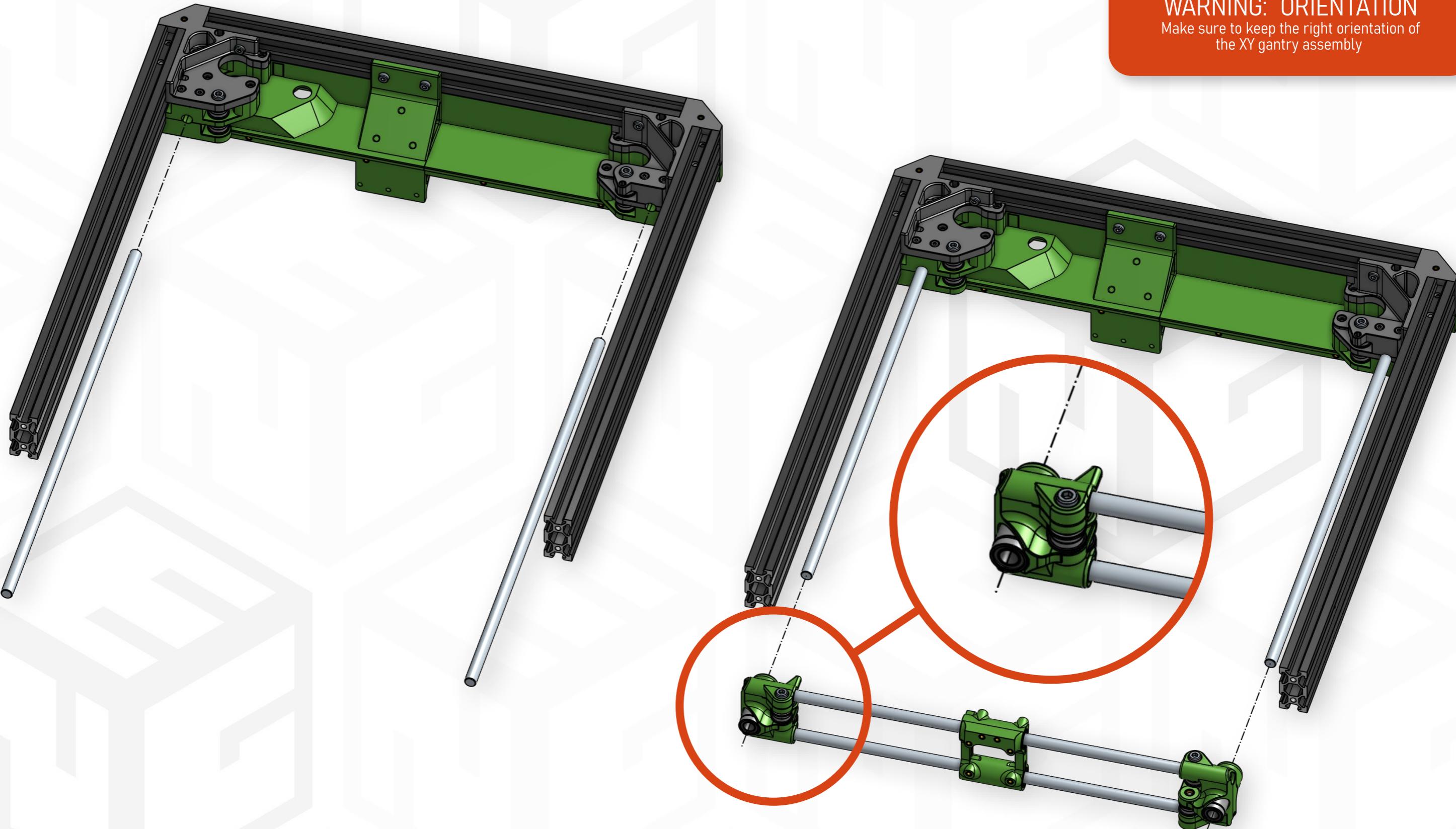
2.5 mm Allen key  
4 mm Allen key

## HARDWARE:

2x 8 x 350 mm Linear rod

# TOP FRAME ASSEMBLY

## XY GANTRY



**WARNING: LOOSEN X RODS**  
Loosen the M5 screws for tightening the X axis rods, make sure the rods slide in and out easily.

**WARNING: ORIENTATION**  
Make sure to keep the right orientation of the XY gantry assembly

## TOOLS:

1.5 mm Allen key  
3 mm Allen key  
4 mm Allen key

## HARDWARE:

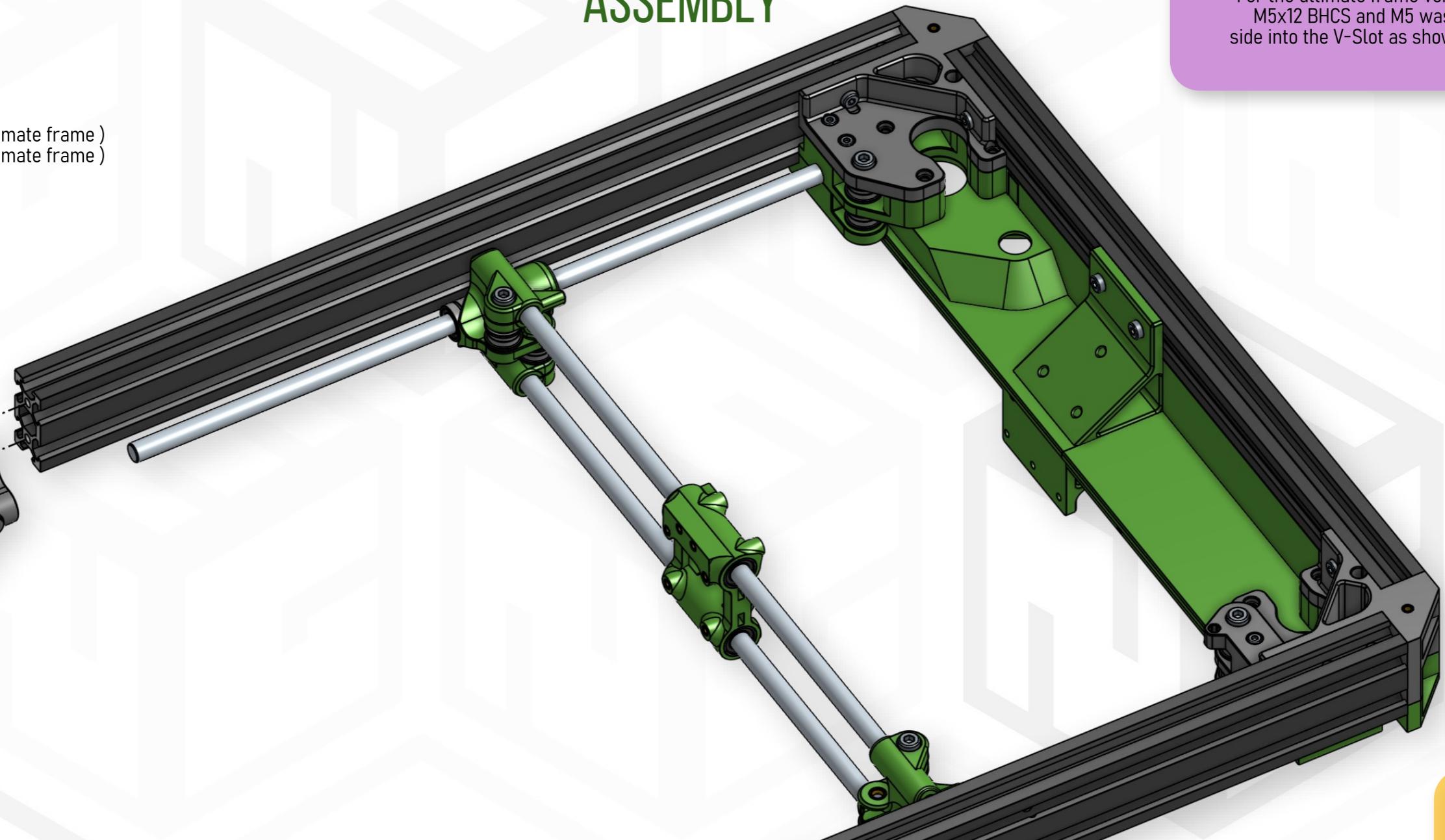
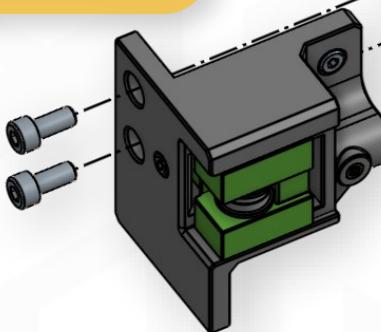
4x M5x12 SHCS  
4x M5x10 BHCS ( Only for ultimate frame )  
4x M5 Washer ( Only for ultimate frame )

# TOP FRAME ASSEMBLY

## ULTIMATE FRAME

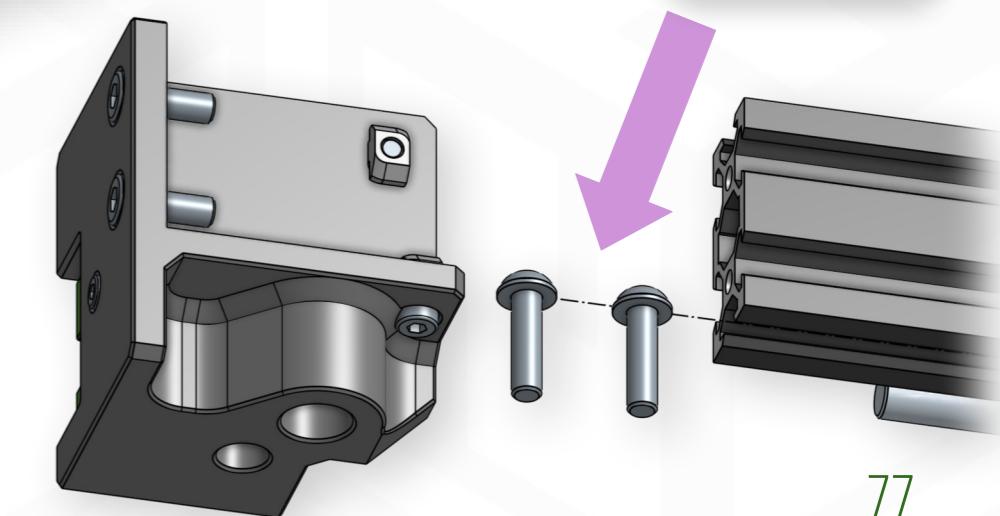
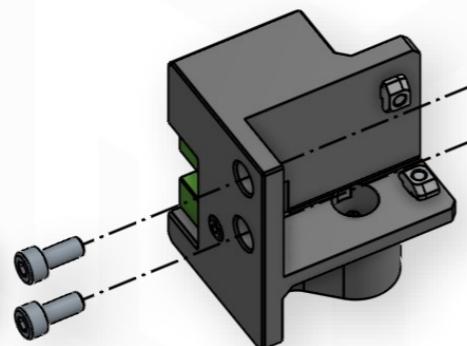
For the ultimate frame version, insert two M5x12 BHCS and M5 washers on each side into the V-Slot as shown in the picture.

M5x12 SHCS



M5x10 BHCS  
M5 Washer

M5x12 SHCS



## TOOLS:

4 mm Allen key

Ruler

# TOP FRAME ASSEMBLY

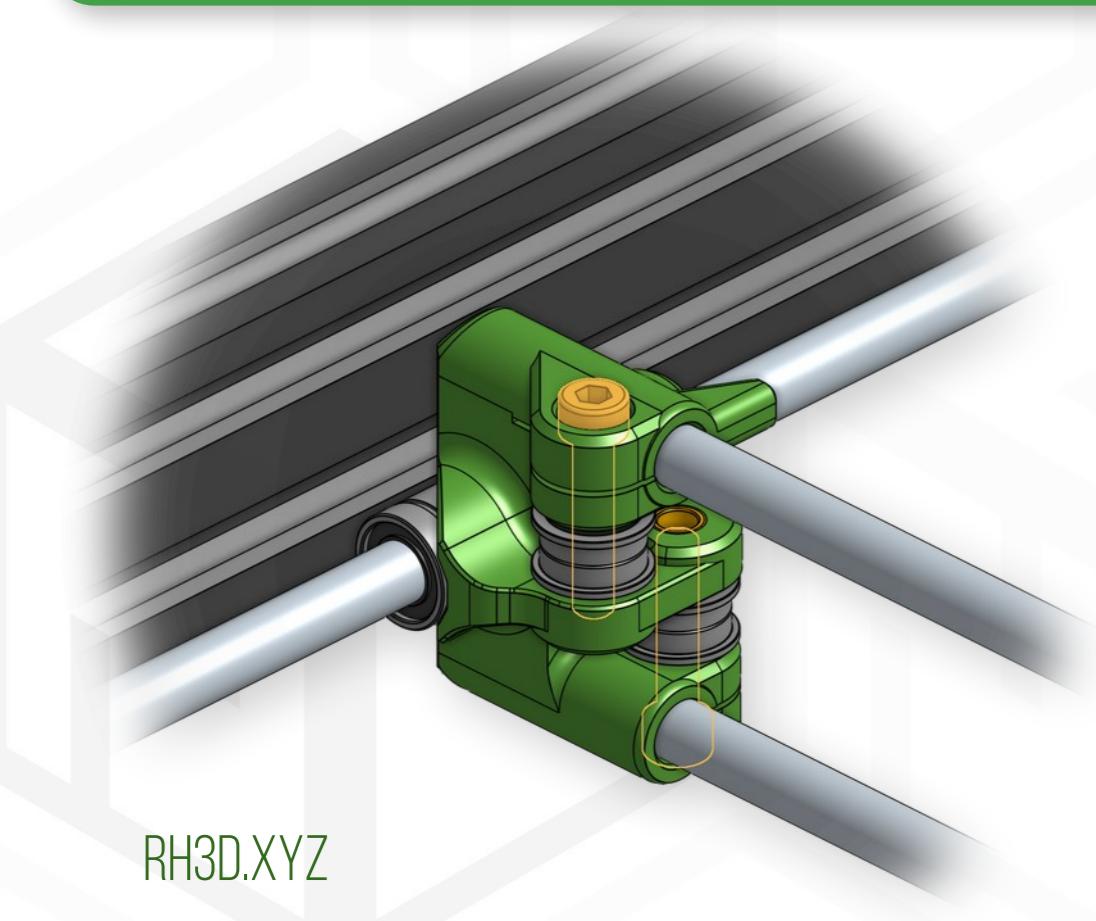
## XY GANTRY ALIGNMENT

In this procedure we will align the distance between the Y gantry blocks ( distance A ) and check the X rod spacing. Follow the steps below:

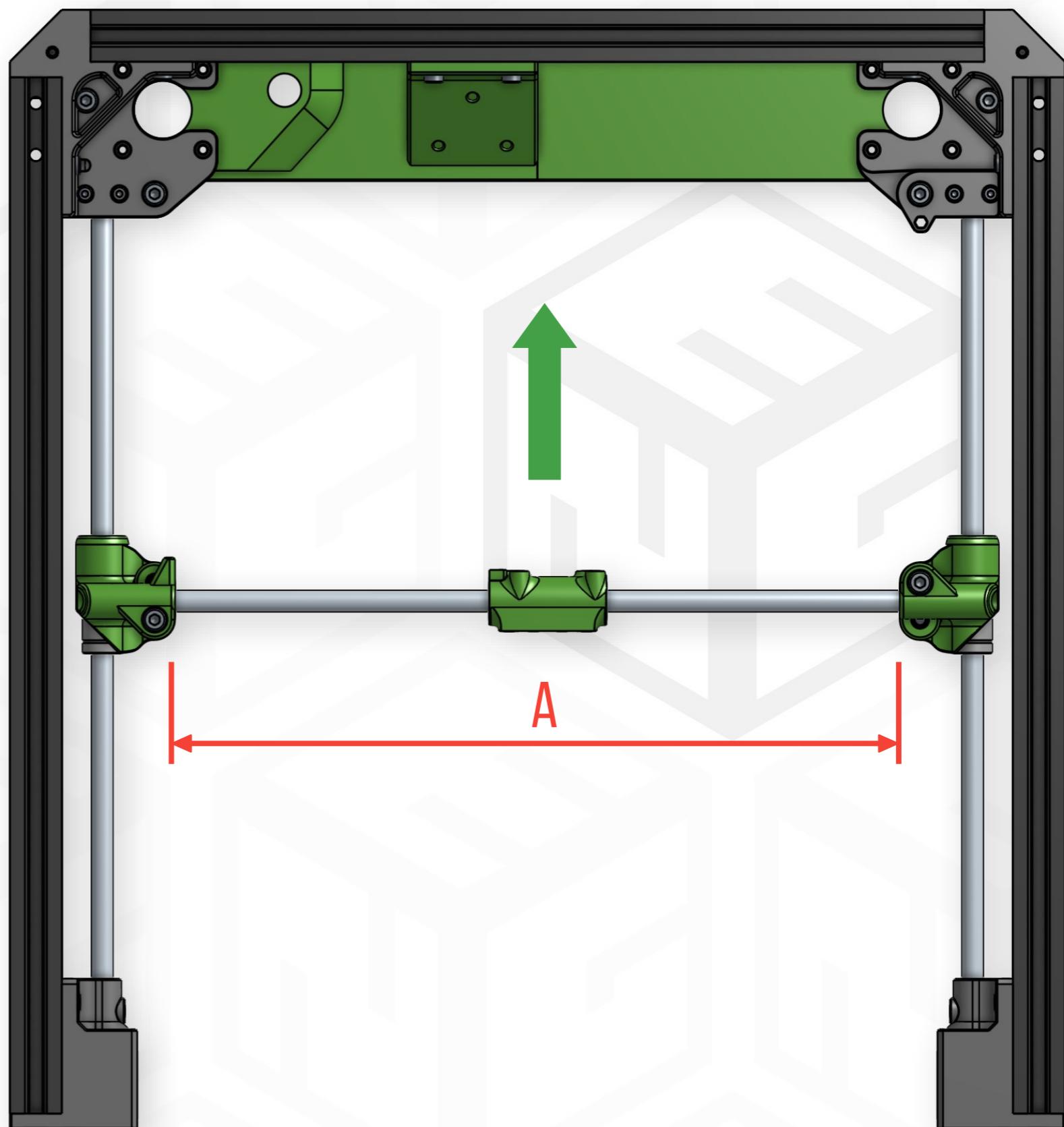
- 1) Make sure the M5 screws in the Y gantry blocks are loose.
- 2) Verify the 8mm X axis rods are sliding in the Y gantry reasonably easily.
- 3) Check the Y axis rods and make sure they are secured properly without noticeable play.
- 4) Move the gantry to the rear end. (Y max)
- 5) Adjust the spacing ( A ) between Y gantry blocks if it doesn't move back and forth easily without any springiness or resistance.  
If the distance is too big or too small, the gantry will be returning to the front by itself.
- 6) Slightly tighten M5 screws on the Y gantry just so the X axis rods will keep the right position.
- 7) Move the toolhead to both the X axis ends to test if it slides easily. If you feel some resistance and/or the toolhead springs back a little bit, adjust the M5 screw tension.

### NOTE: X ROD SPACING

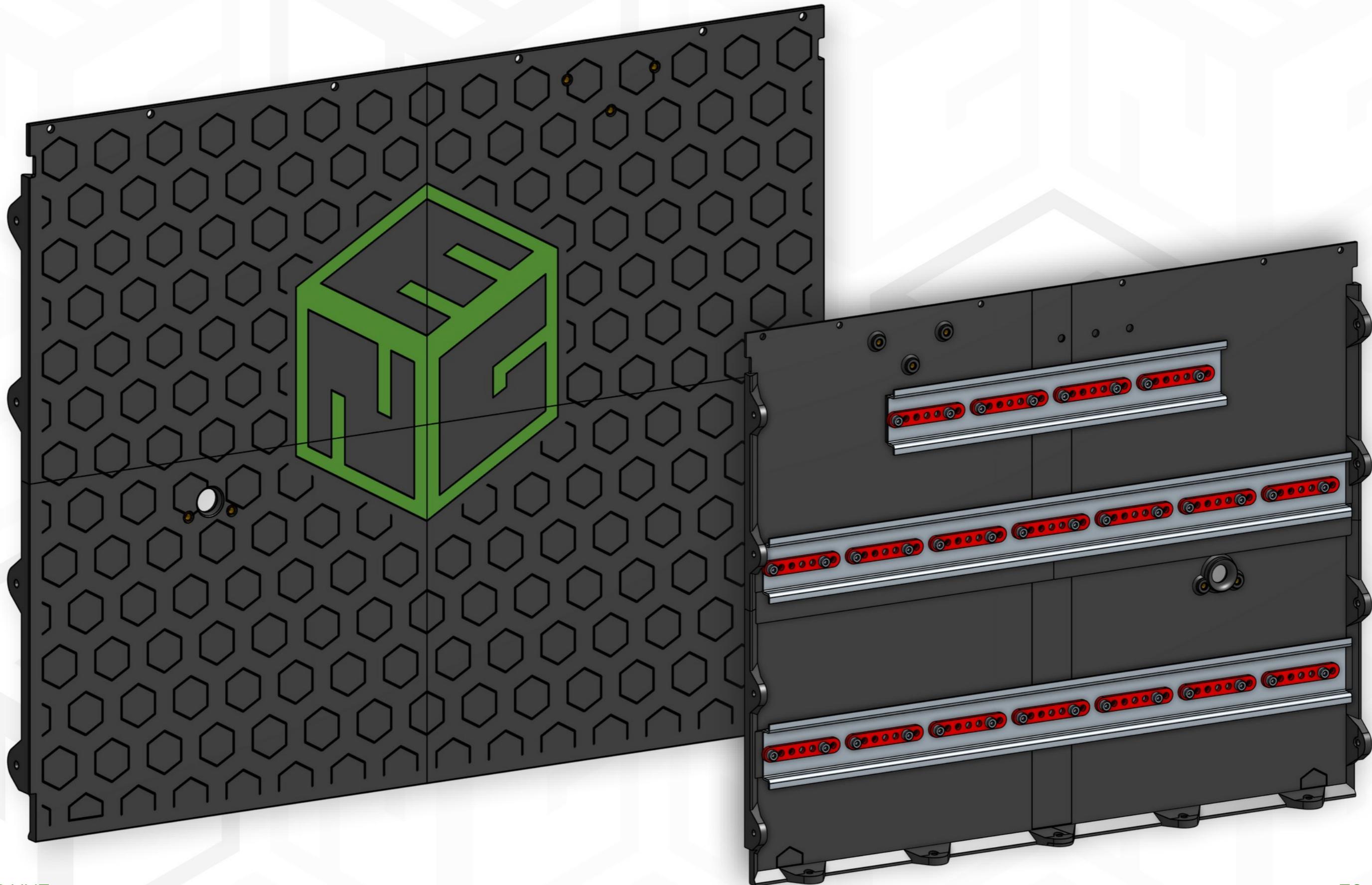
The X rod spacing in the Y gantry blocks is designed to be just right when the M5 screws are properly tightened. If you tighten the screws too much or too little, the part will get compressed a bit too much or too little resulting in wrong X rod spacing and thus not smooth toolhead motion on the X axis ends. Adjust the tension until the motion is smooth without resistance.



## XY GANTRY ALIGNMENT



# ELECTRONICS PANEL



# ELECTRONICS PANEL PREPARATION

## TOOLS:

Heat set insert press  
Razor knife  
File (to clean the edges and provide precise fit)  
Masking tape (to hold panels aligned together)

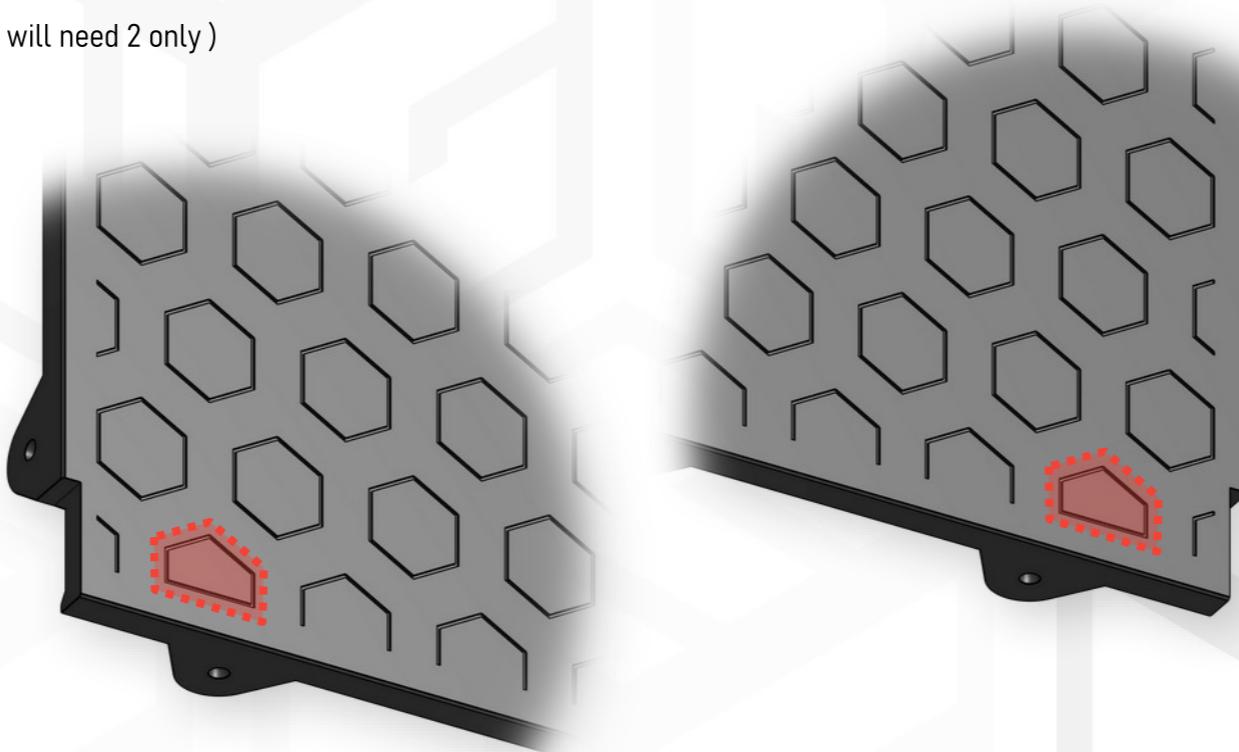
## HARDWARE:

5x M3 Heat insert (If you use other probe than Klicky, you will need 2 only)

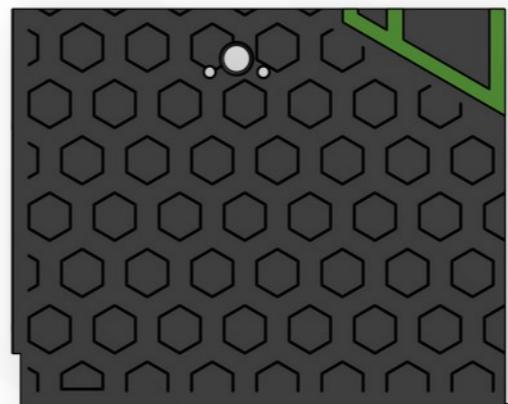
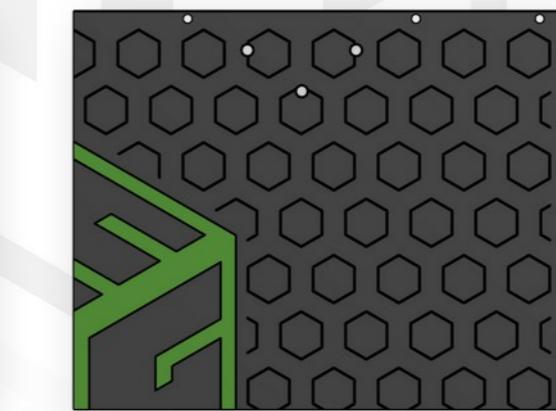
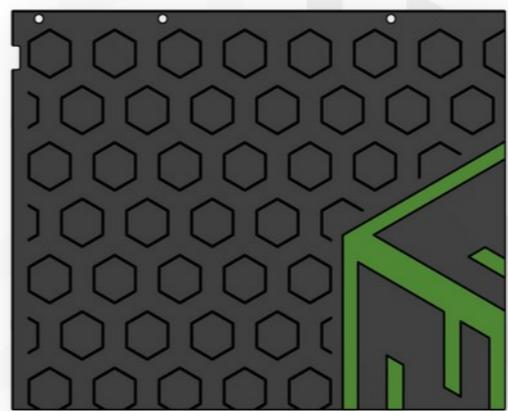
## PRINTED PARTS:

electronics\_panel\_lower\_left.stl  
electronics\_panel\_lower\_right.stl  
electronics\_panel\_upper\_left.stl  
electronics\_panel\_upper\_right.stl

M3 Heat Set Inserts



M3 Heat Set Inserts



**NOTE: WIRING HOLES CUTOUT**  
Look for the half hexagons at the bottom side corners and cut them out for the Z stepper wires, auxiliary fan wires etc. based on your setup. Clean the hole following the edge of the half-hex.

Standard setup:  
One Z stepper, no aux fans – cut only the right hole.  
Three Z stepper motors / aux fans – cut both holes.

## TIP: KLICKY PROBE

Marked heat inserts are used for Klicky and KlickyPCB probe dock. If you will use other probe, you don't need to install them.

## TIP: PANEL ALIGNMENT

Test the panel fit, check edges, clean overextruded corners, blobs, etc. I recommend to use masking tape on the logo side to hold panels together and keep properly aligned for the glue up process.

# ELECTRONICS PANEL GLUE UP

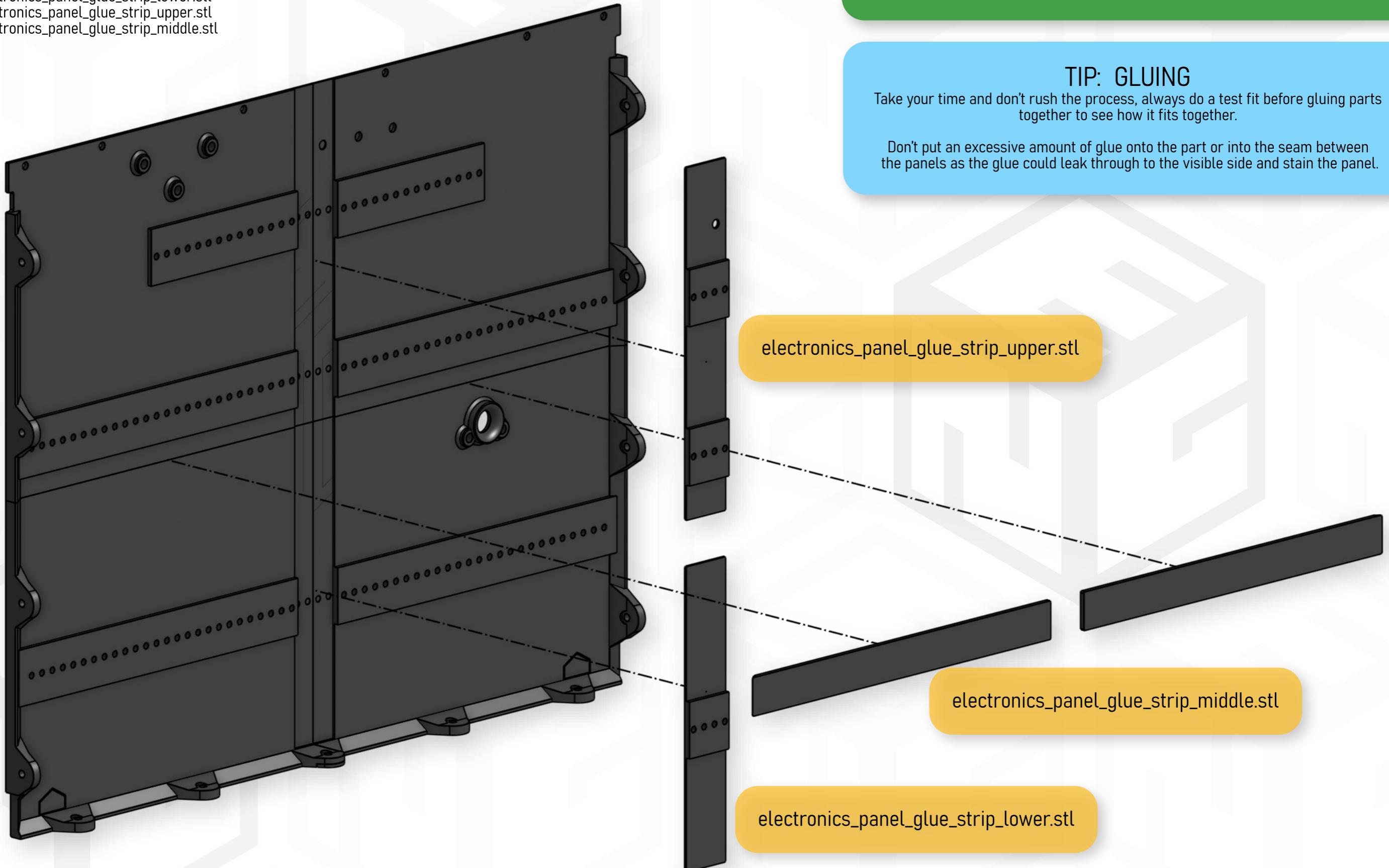
## TOOLS:

Glue ( CA glue is ok )

## PRINTED PARTS:

electronics\_panel\_glue\_strip\_lower.stl  
electronics\_panel\_glue\_strip\_upper.stl  
electronics\_panel\_glue\_strip\_middle.stl

2x



## NOTE: GLUING PANELS

Put the panel logo side on a flat surface and glue it together using the glue strips starting with the vertical ones and following with the horizontal ones.

Wait for the glue to fully dry before any manipulation with the panel.

## TIP: GLUING

Take your time and don't rush the process, always do a test fit before gluing parts together to see how it fits together.

Don't put an excessive amount of glue onto the part or into the seam between the panels as the glue could leak through to the visible side and stain the panel.

# ELECTRONICS PANEL DIN RAILS

## TOOLS:

2.5 mm Allen key

## HARDWARE:

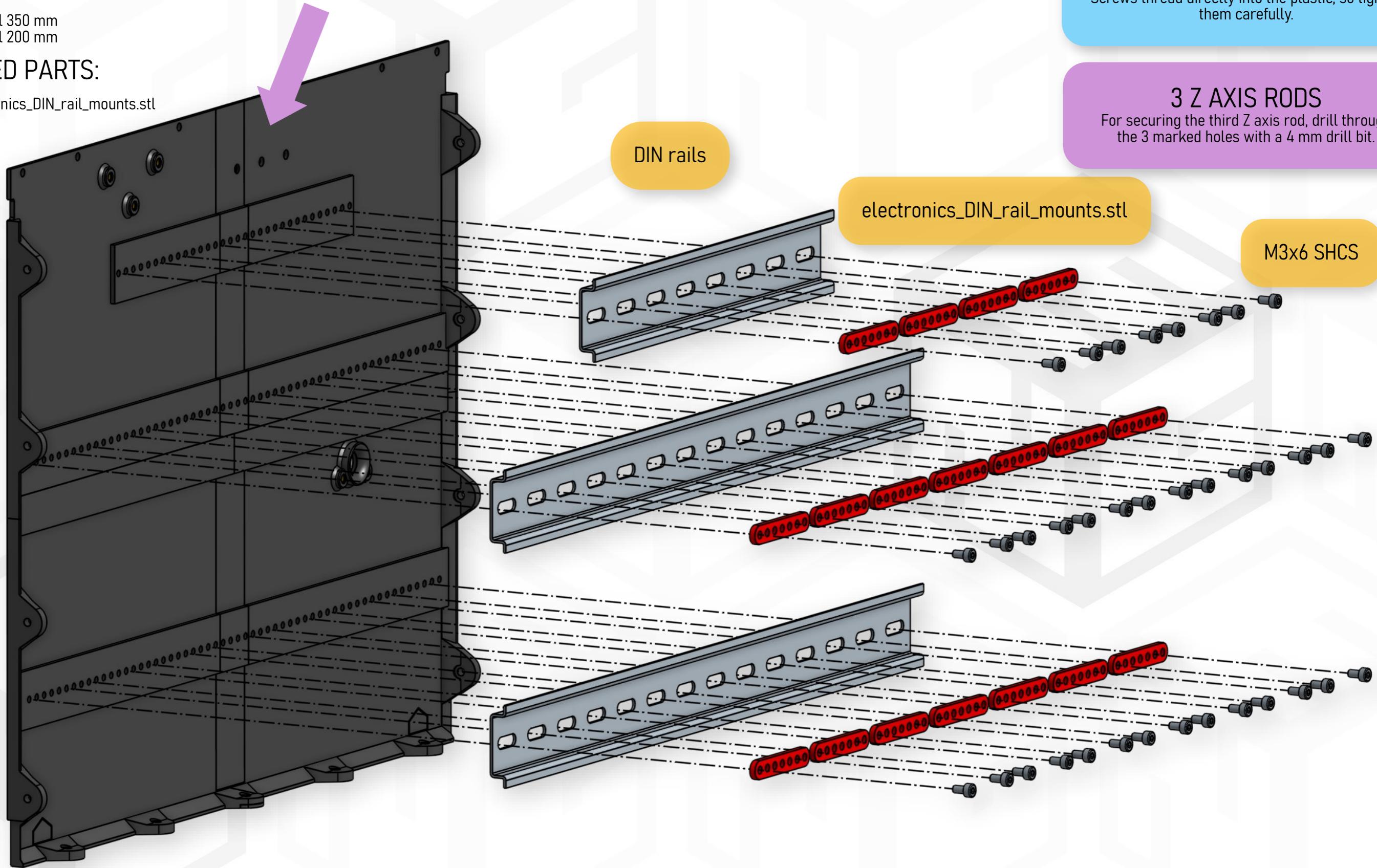
36x M3x6 SHCS

2x DIN rail 350 mm

1x DIN rail 200 mm

## PRINTED PARTS:

18x electronics\_DIN\_rail\_mounts.stl



## TIP: SCREW COUNT

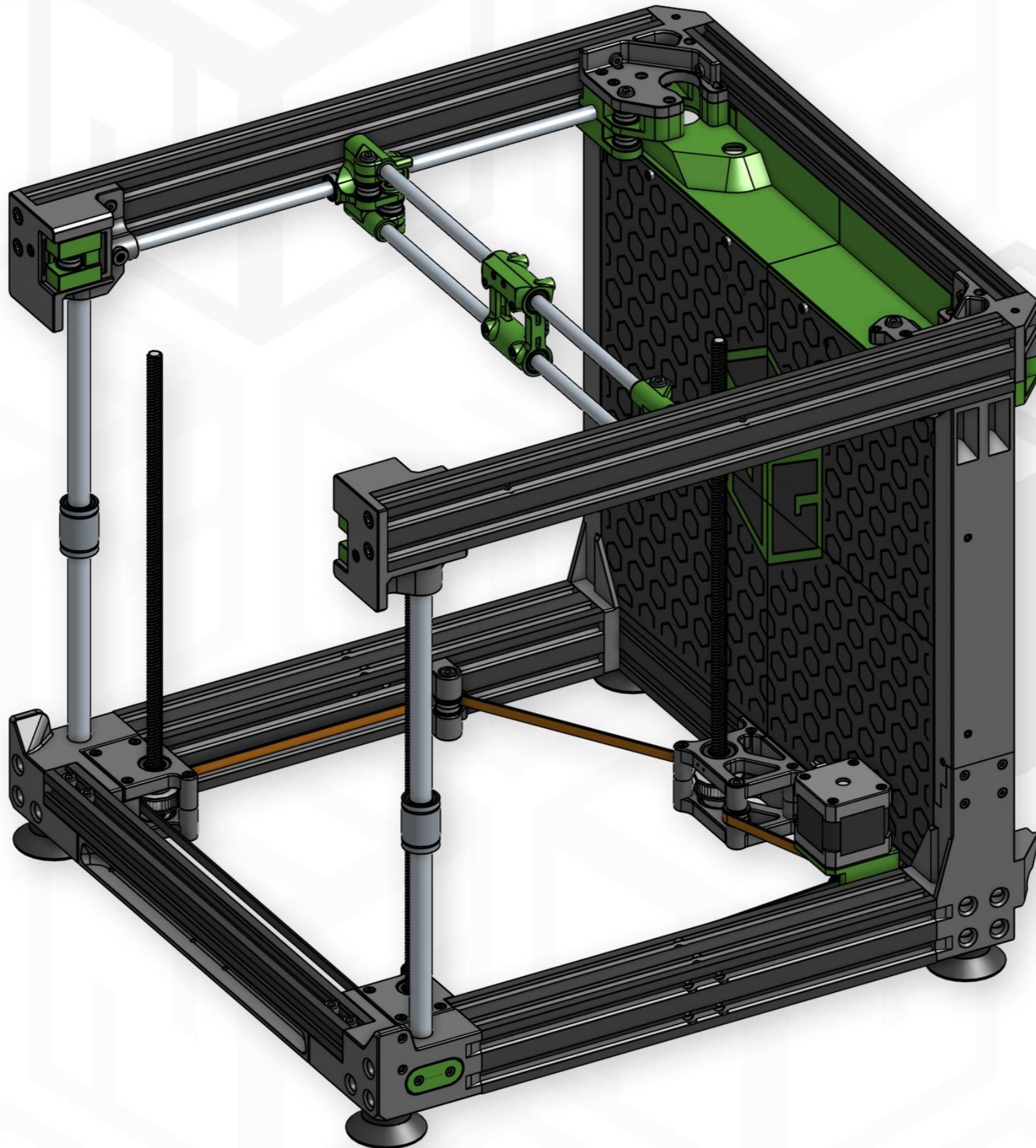
To install DIN rails, there are multiple holes for M3 screws to support various DIN rail types. It is recommended to use at least two screws in each of the printed rail mounts. Screws thread directly into the plastic, so tighten them carefully.

## 3 Z AXIS RODS

For securing the third Z axis rod, drill through the 3 marked holes with a 4 mm drill bit.

PRINTED FRAME

# FRAME ASSEMBLY



PRINTED FRAME

## FRAME ASSEMBLY PANEL INSTALL

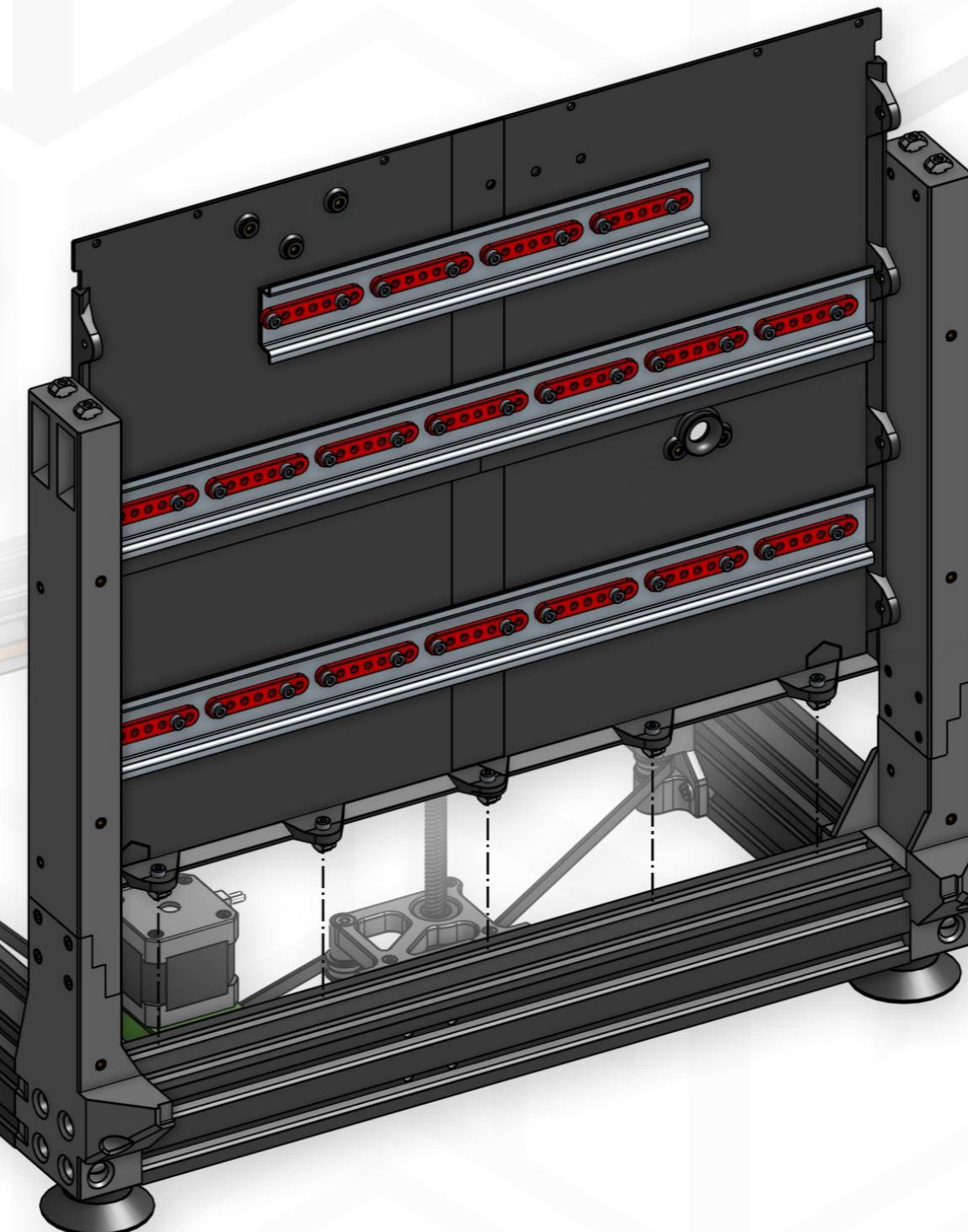
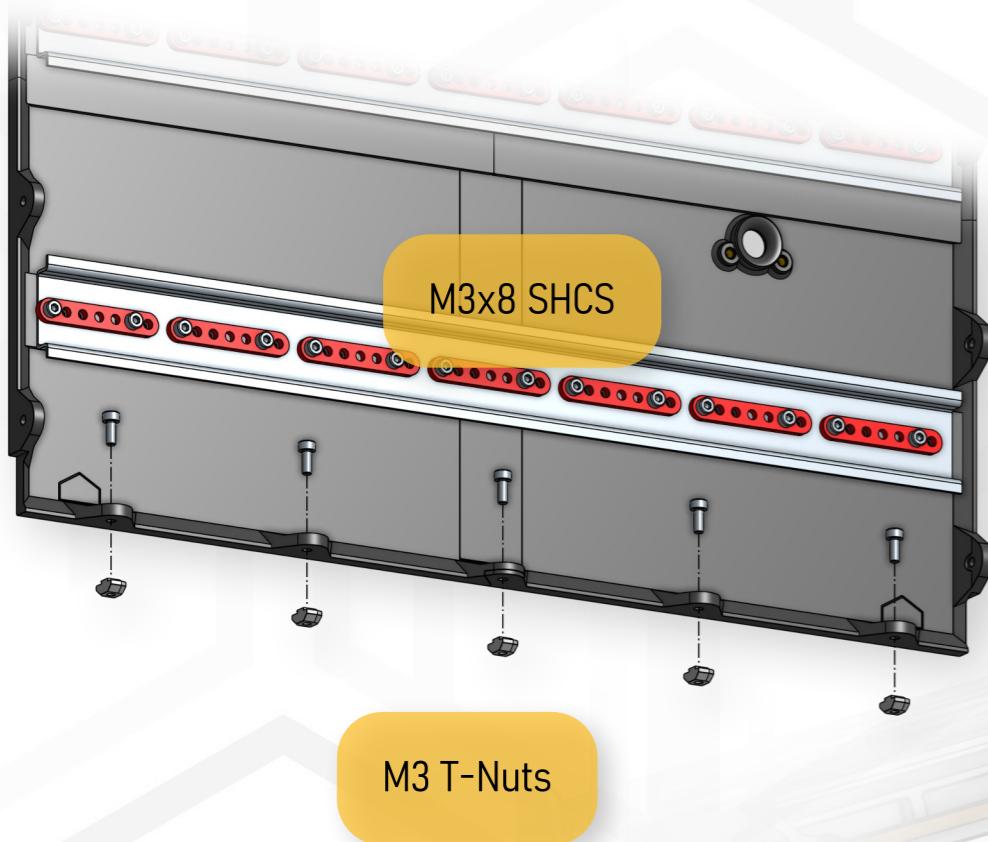
REPEAT FOR THE OTHER SIDE!

TOOLS:

2.5 mm Allen key

HARDWARE:

13x M3x8 SHCS  
5x M3 T-Nut



PRINTED FRAME

# FRAME ASSEMBLY

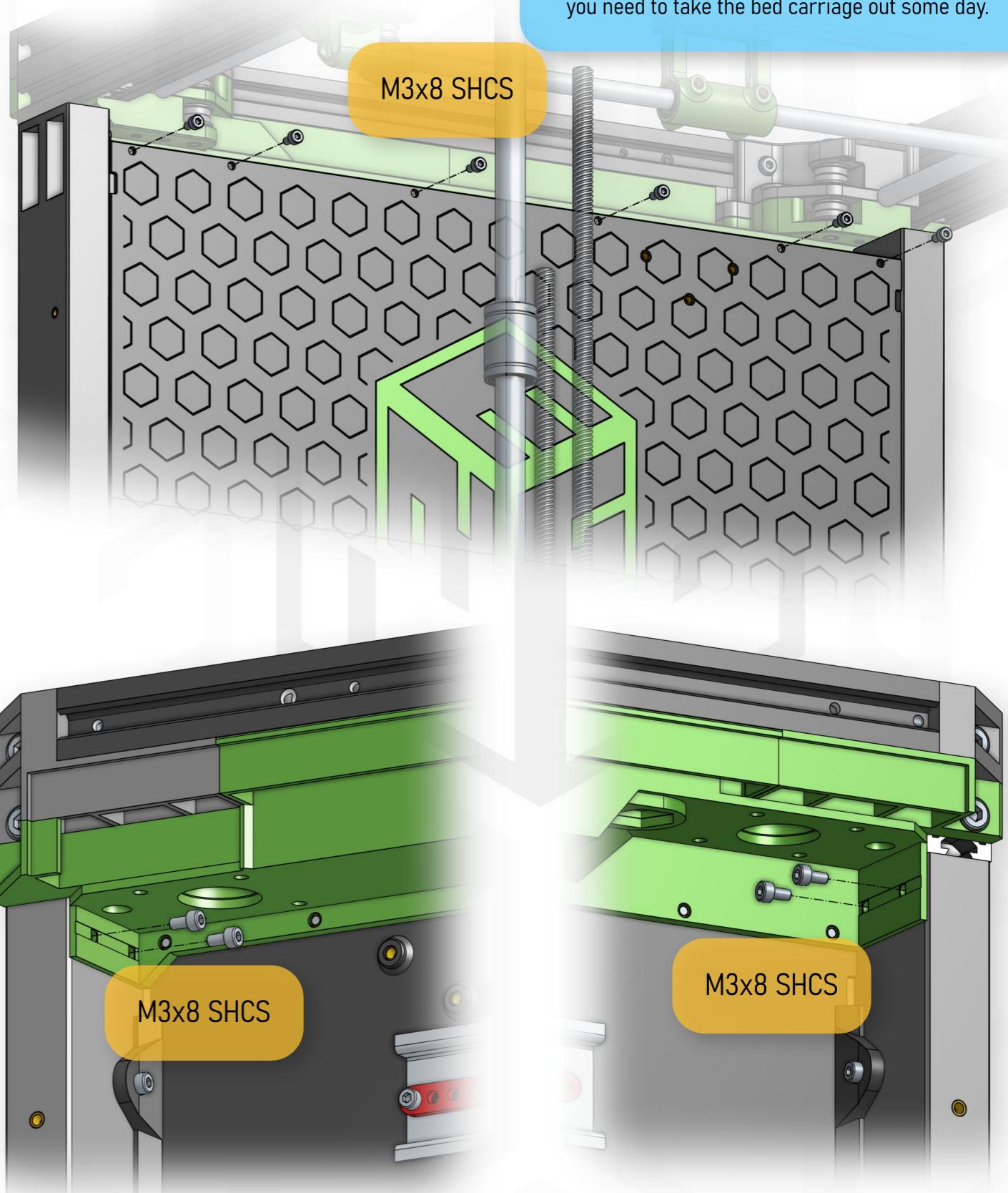
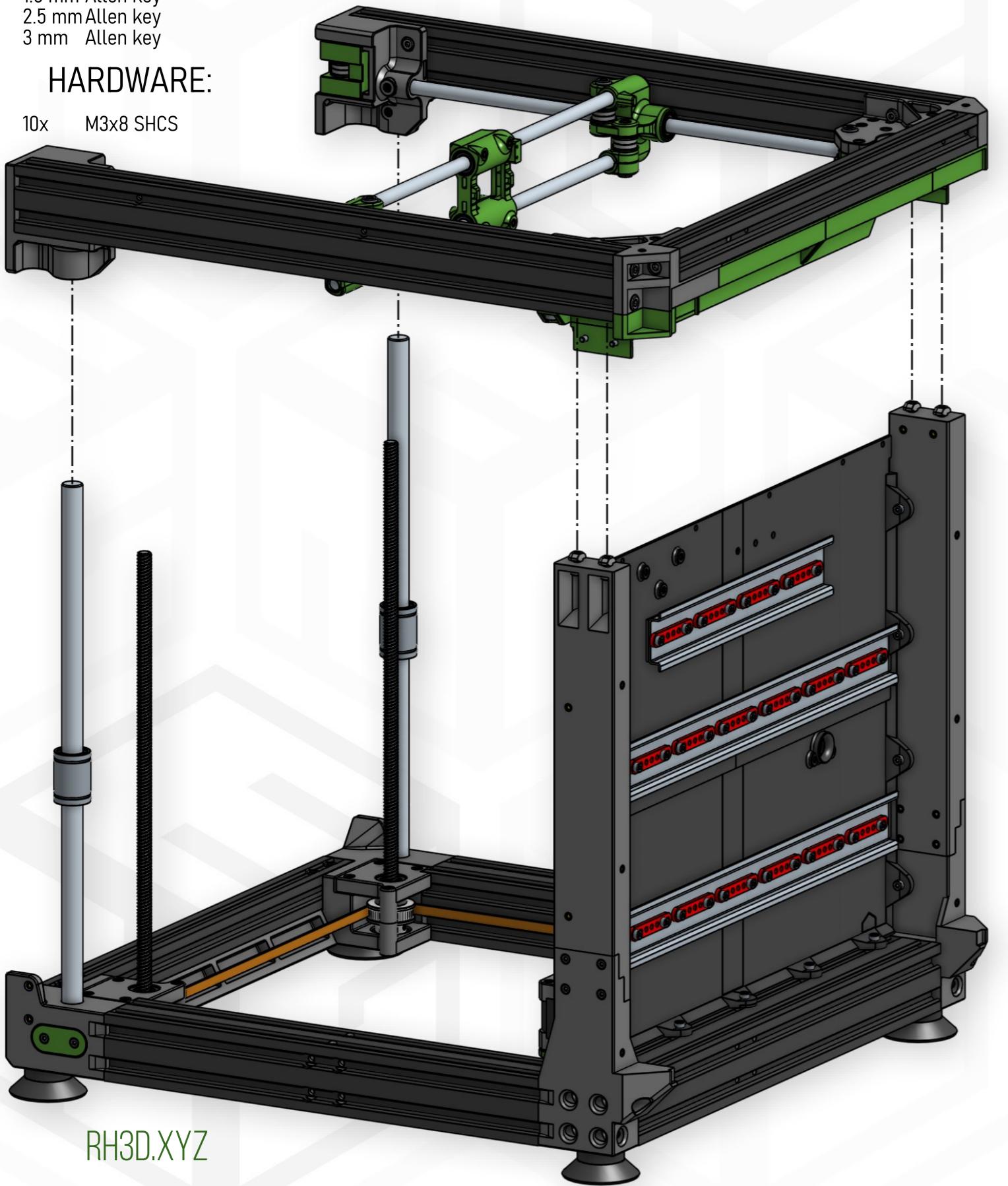
## TOP FRAME INSTALL

TOOLS:

1.5 mm Allen key  
2.5 mm Allen key  
3 mm Allen key

HARDWARE:

10x M3x8 SHCS



### TIP: BED CARRIAGE

Usually, we would install the bed carriage before this step for a simpler process and you can do so without issues. In that case, follow the bed assembly in pages 97-105 and then come back.

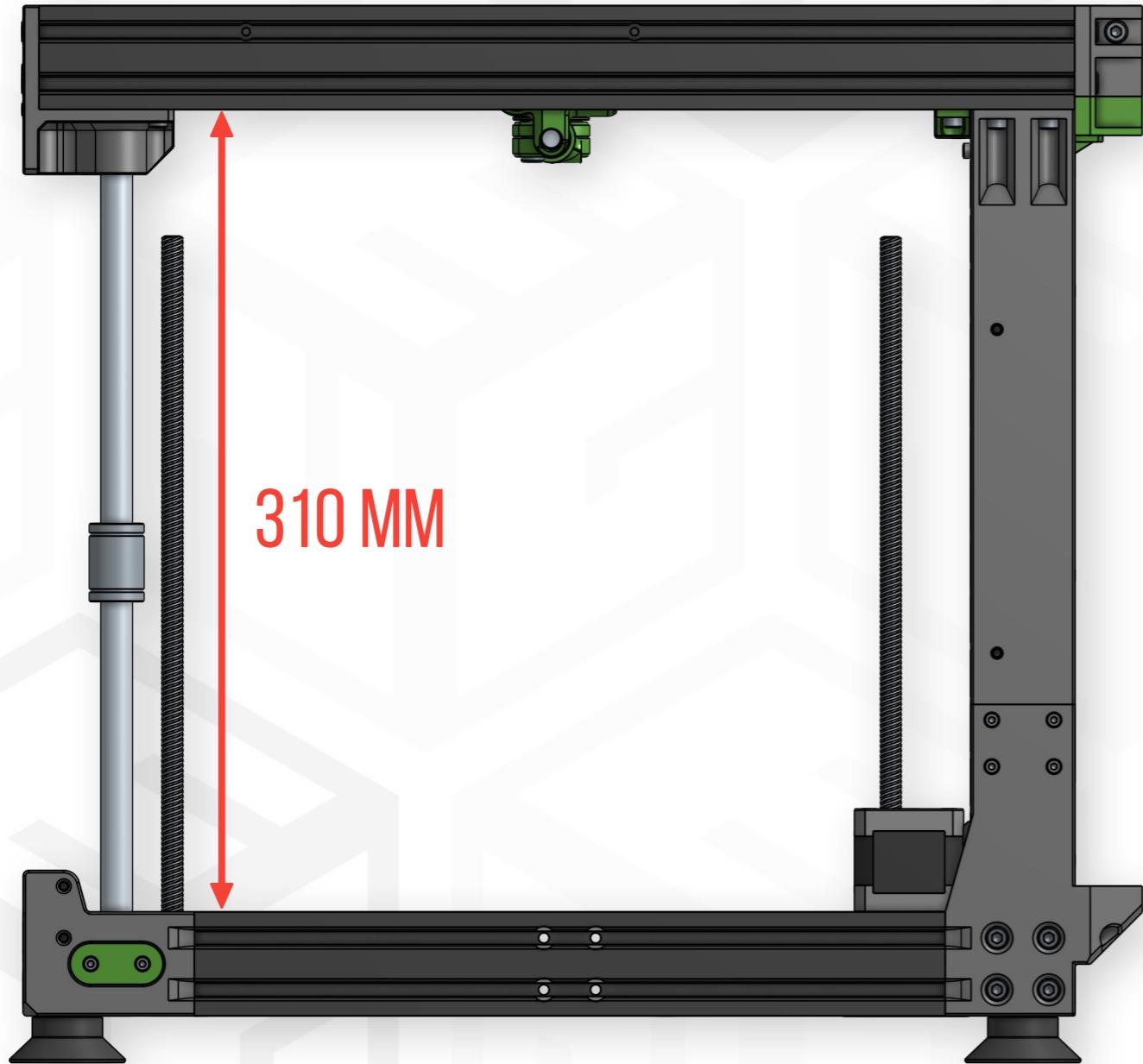
This guide installs the bed after the frame is assembled to show the process of doing it in case you need to take the bed carriage out some day.

## PRINTED FRAME

# FRAME ASSEMBLY Z HEIGHT ALIGNMENT

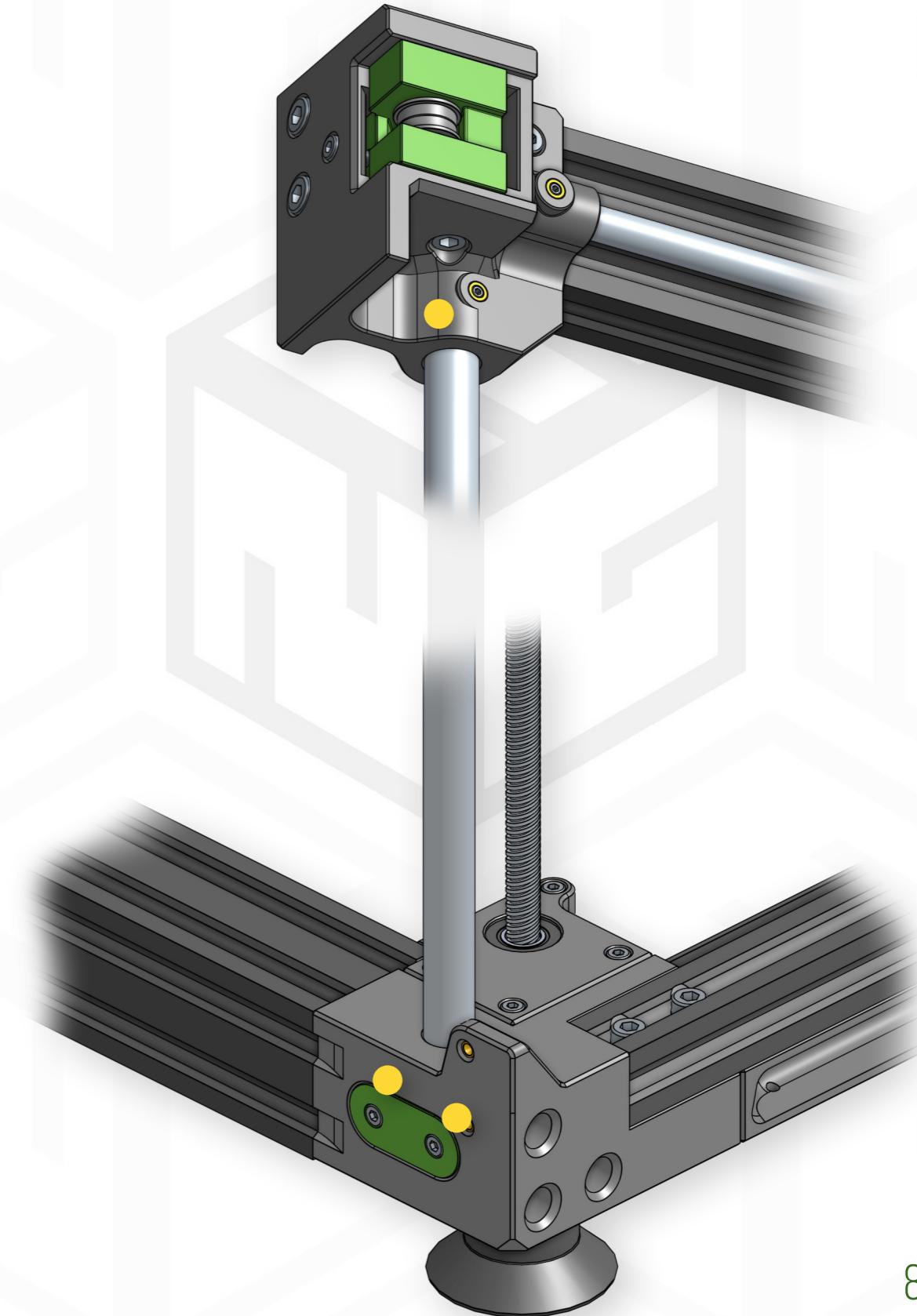
## TOOLS:

1.5 mm Allen key  
2.5 mm Allen key  
Ruler (310mm)



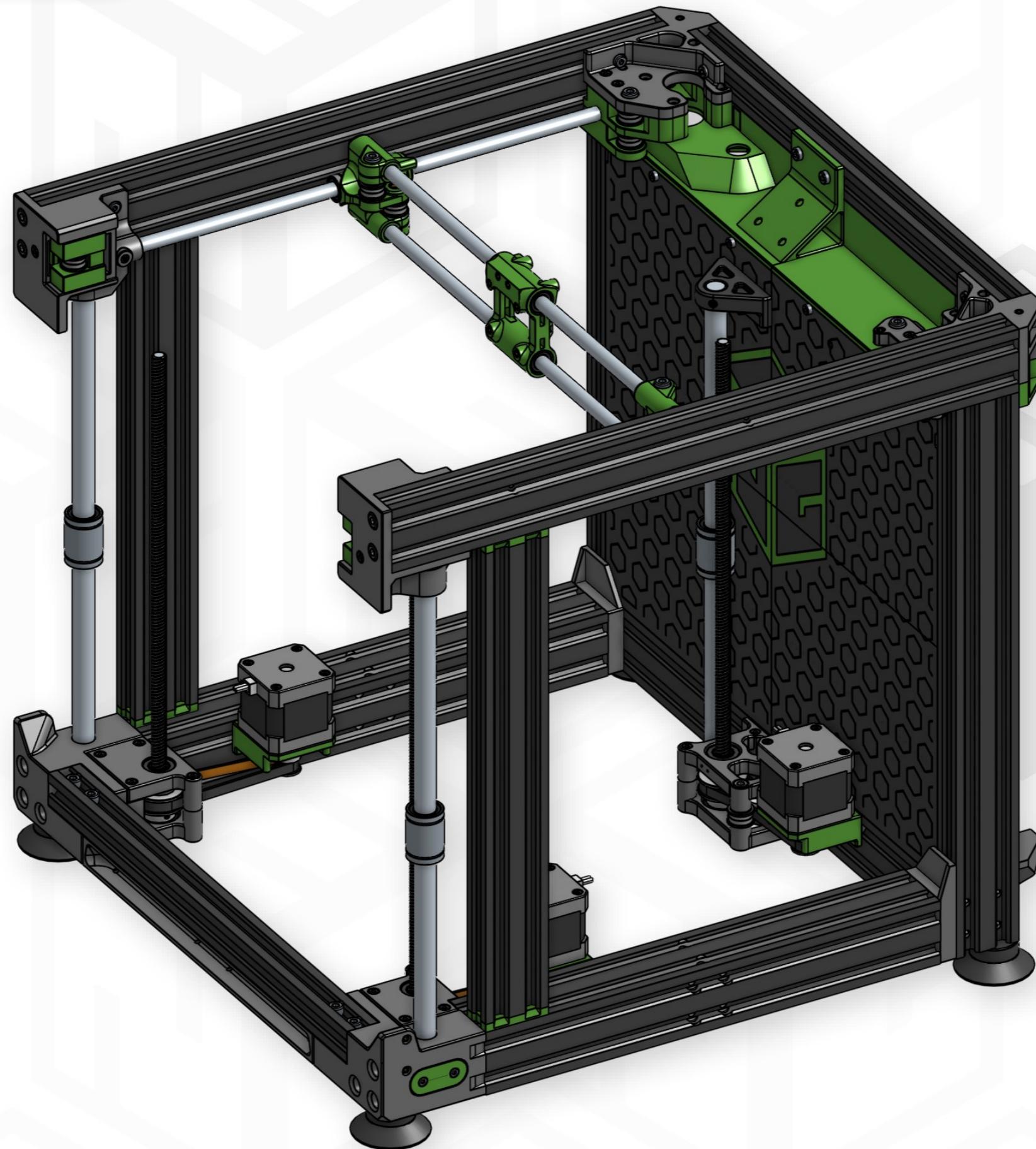
## NOTE: FRAME DIMENSIONS

For proper installation, loosen the Z axis rods and push them all the way inside the top hole until it bottoms out. Then first tighten the top M3 setscrew, measure the Z height at the front - between the bottom and top extrusions. You can compare it to the value measured at the rear but it should be 310 mm. After adjusting, tighten the bottom Z rod mounts.



2040 / ULTIMATE FRAME

# FRAME ASSEMBLY



## 2040 / ULTIMATE FRAME

# FRAME ASSEMBLY PANEL INSTALL

### TOOLS:

2.5 mm Allen key

### HARDWARE:

13x M3x8 SHCS  
13x M3 T-Nut

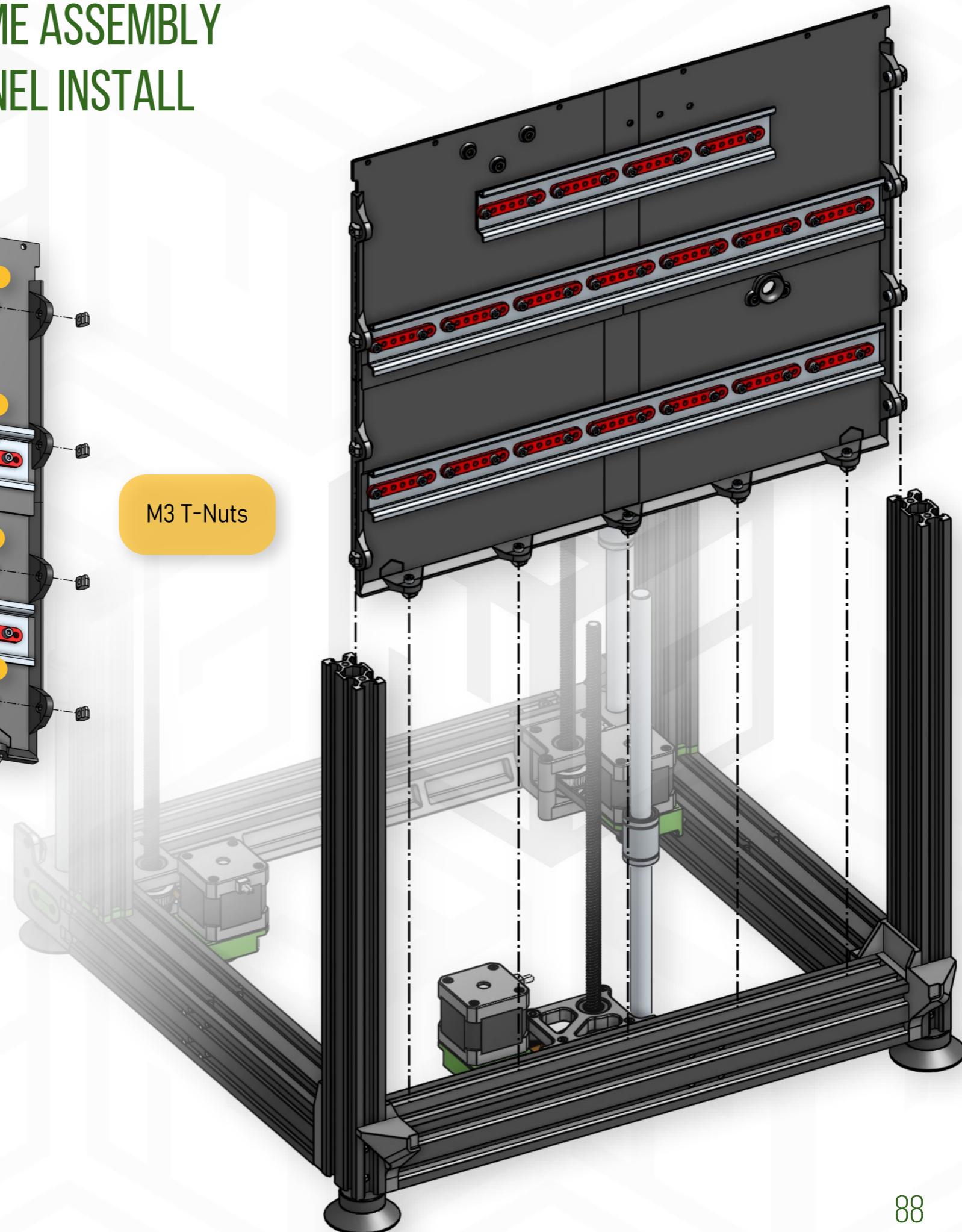
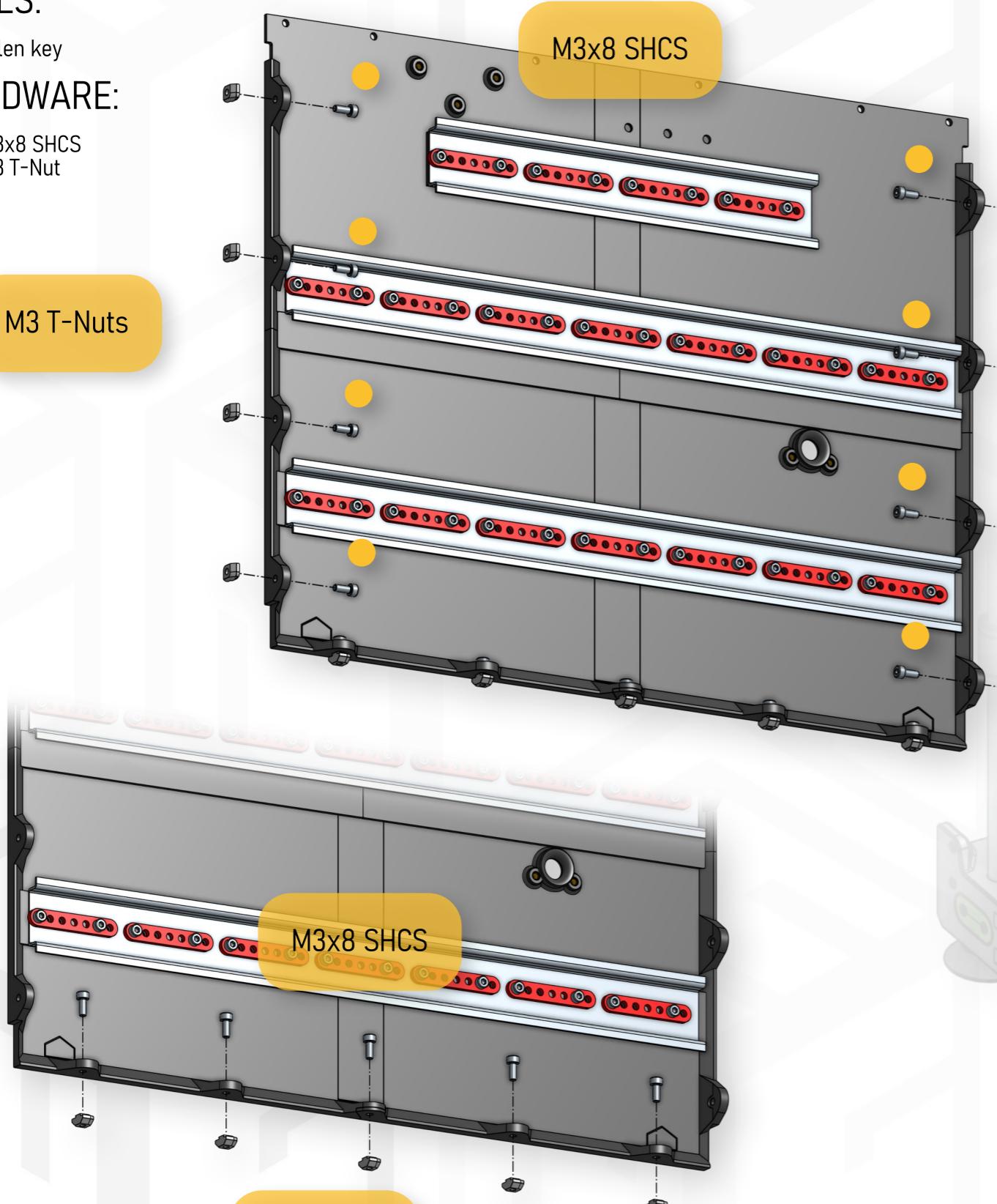
M3 T-Nuts

M3x8 SHCS

M3 T-Nuts

M3x8 SHCS

M3 T-Nuts



## 2040 / ULTIMATE FRAME

# FRAME ASSEMBLY TOP FRAME INSTALL

### TOOLS:

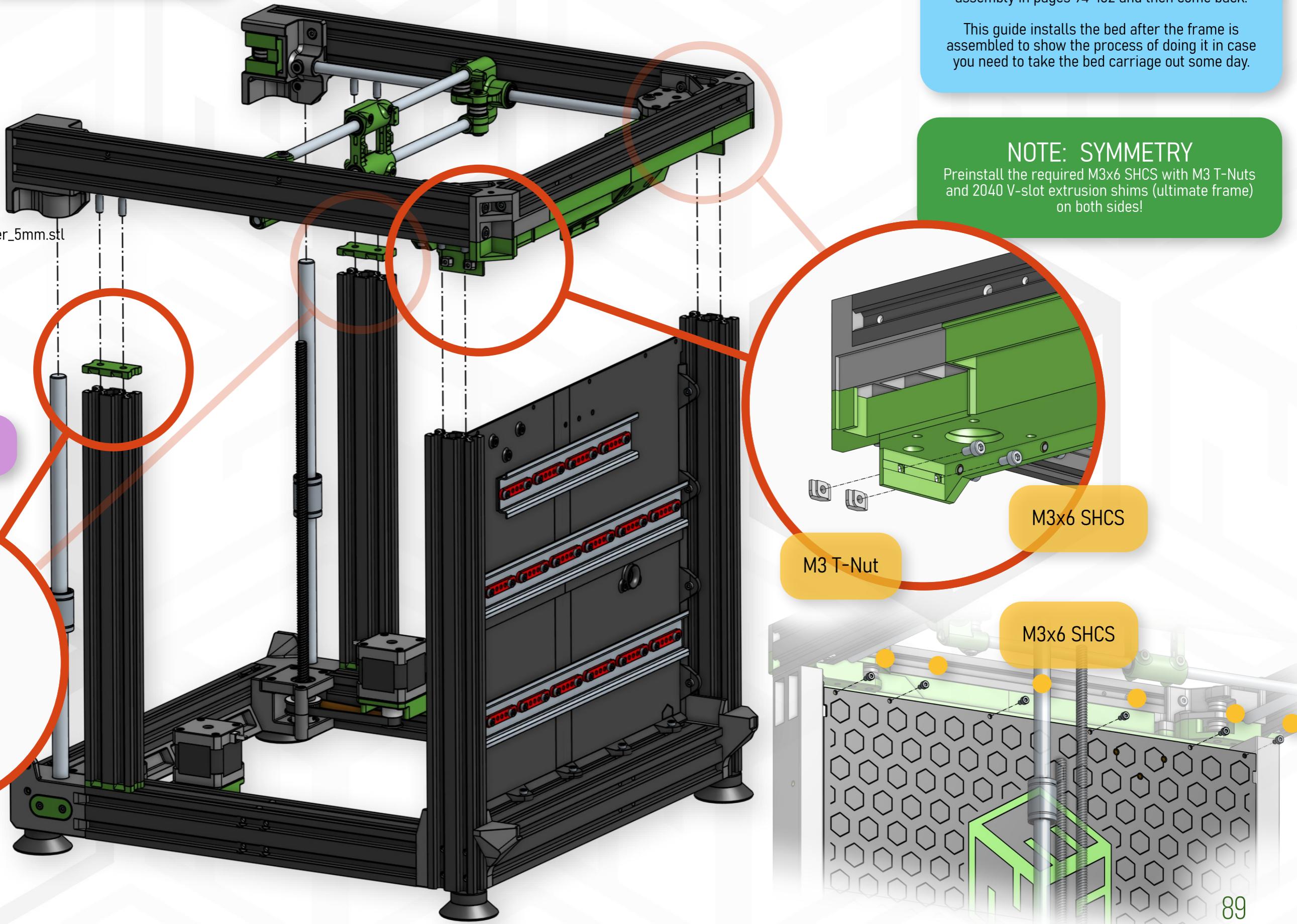
1.5 mm Allen key  
2.5 mm Allen key  
3 mm Allen key

### HARDWARE:

4x M3x6 SHCS  
4x M3 T-Nut

### PRINTED PARTS:

2x frame\_optional\_2040\_spacer\_5mm.stl  
(= both sides)

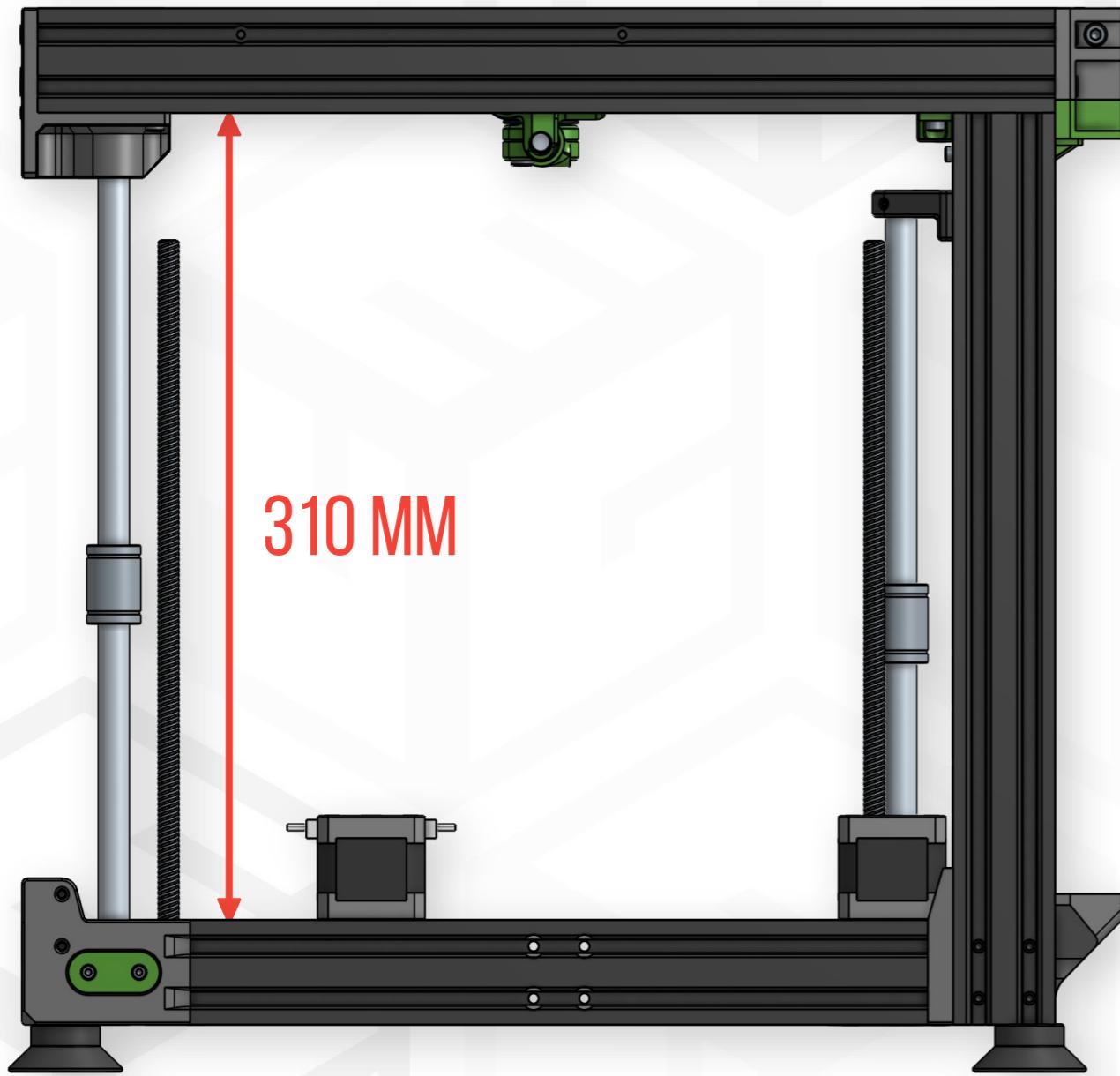


## 2040 FRAME

# FRAME ASSEMBLY Z HEIGHT ALIGNMENT

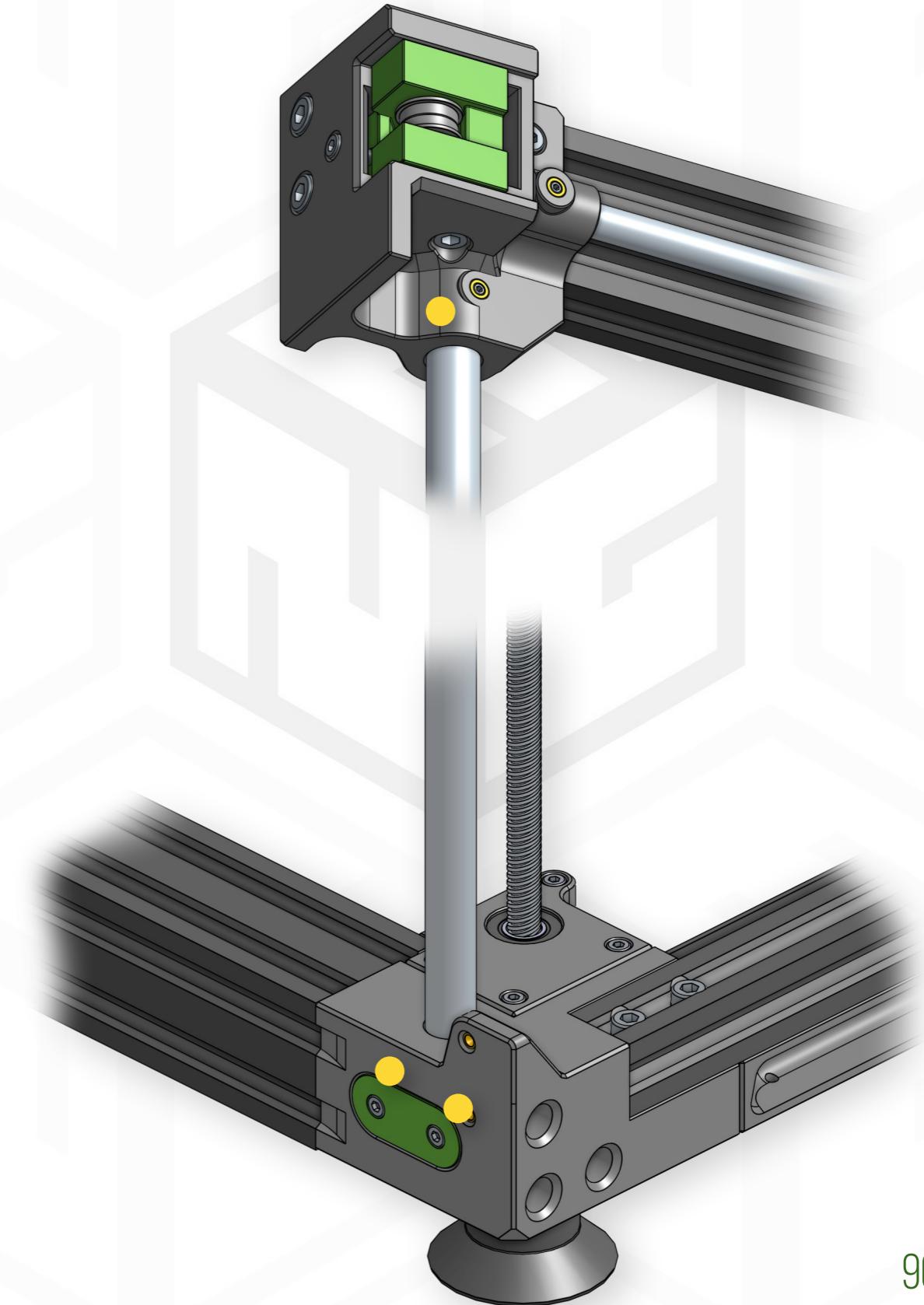
### TOOLS:

1.5 mm Allen key  
2.5 mm Allen key  
Ruler (310mm)



### NOTE: FRAME DIMENSIONS

For proper installation, loosen the Z axis rods and push them all the way inside the top hole until it bottoms out. Then first tighten the top M3 setscrew, measure the Z height at the front - between the bottom and top extrusions. You can compare it to the value measured at the rear but it should be 310 mm. After adjusting, tighten the bottom Z rod mounts.



## 3 Z AXIS RODS

# FRAME ASSEMBLY 3 Z ROD MOUNT

### TOOLS:

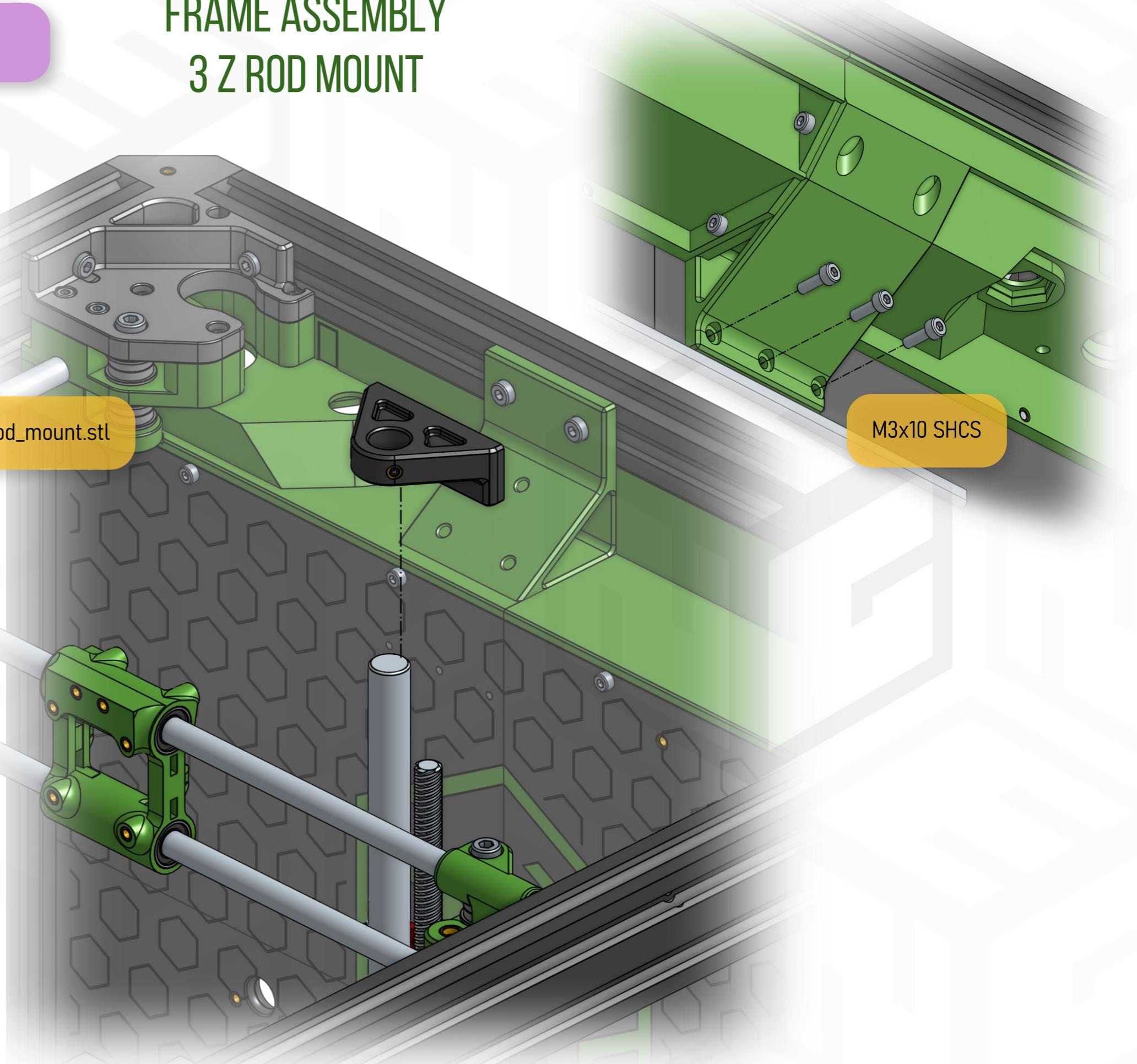
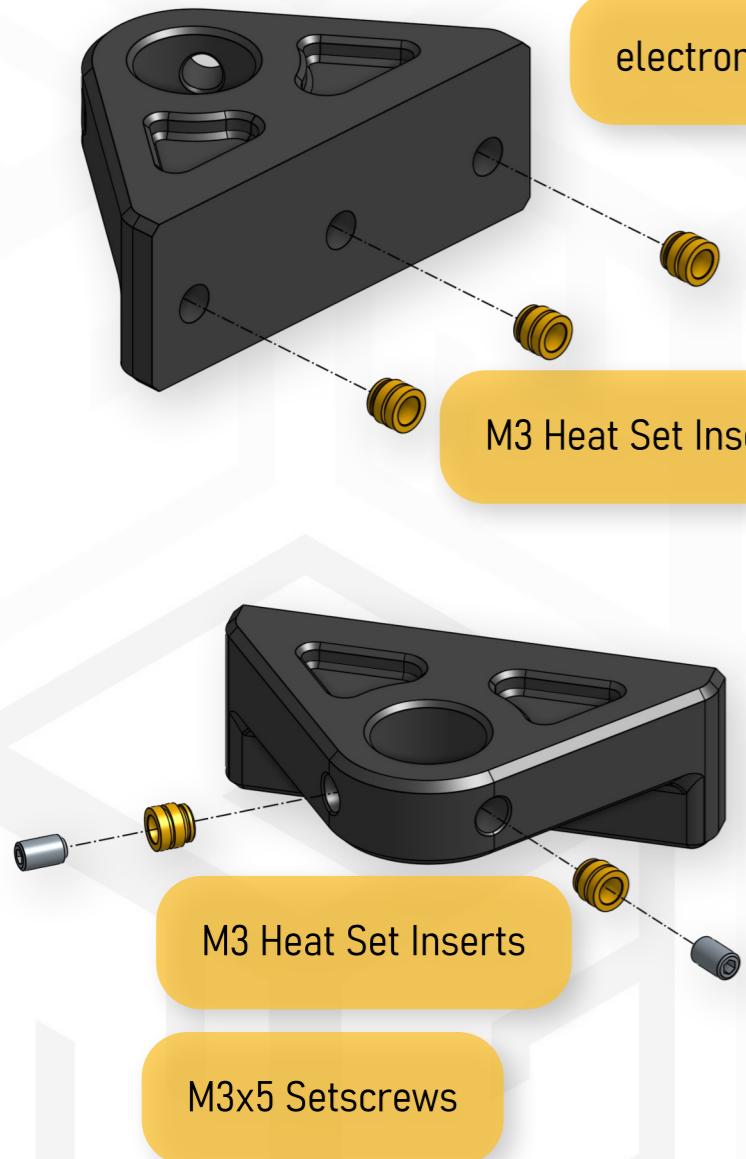
Heat set insert press  
1.5 mm Allen key  
2.5 mm Allen key

### HARDWARE:

3x M3x10 SHCS  
2x M3x5 setscrew  
5x M3 Heat insert

### PRINTED PARTS:

electronics\_panel\_rod\_mount.stl



NO AB STEPPER COOLING

# AB STEPPER MOTORS INSTALL

## TOOLS:

1.5 mm Allen key  
2.5 mm Allen key  
Ruler

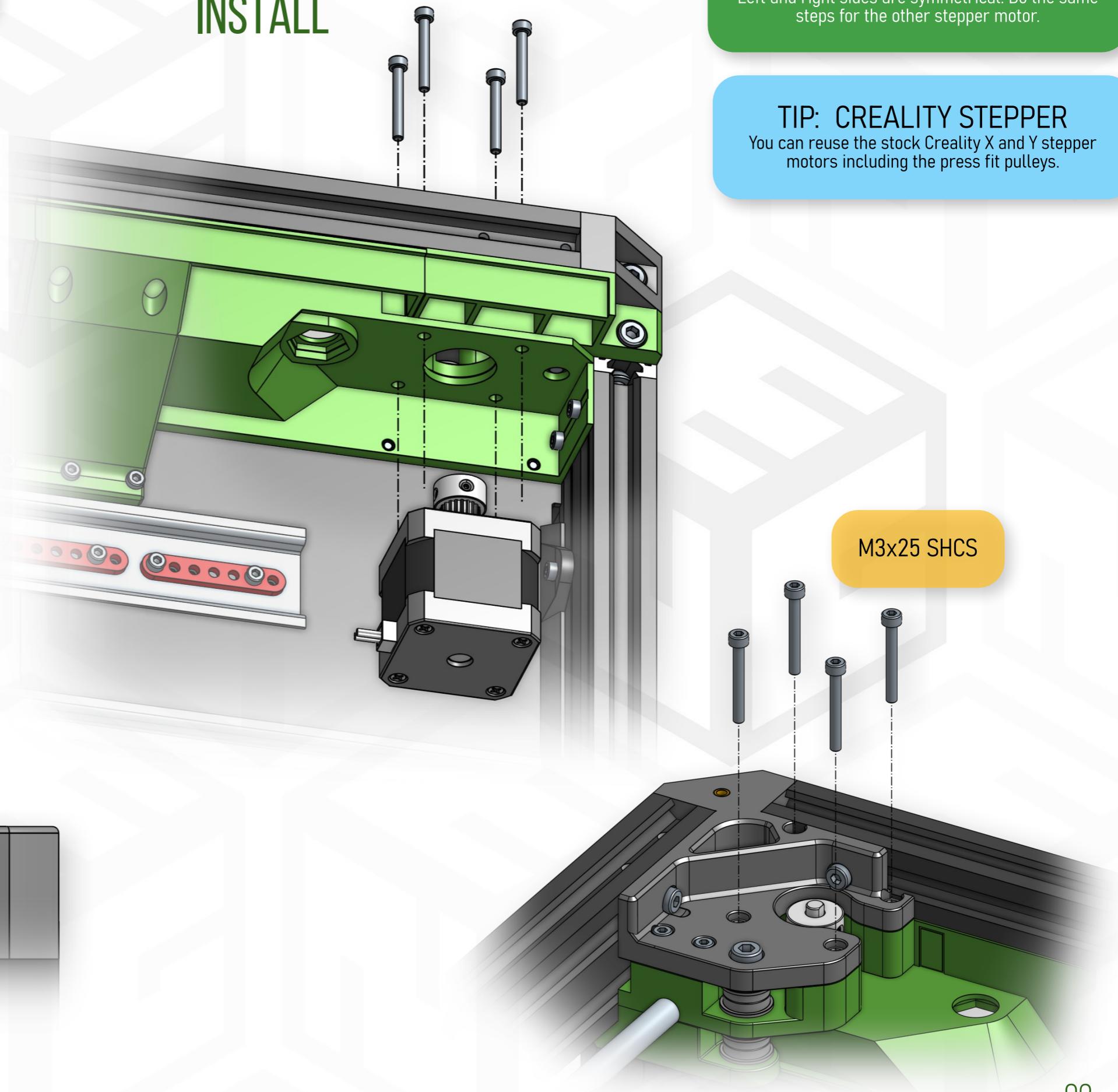
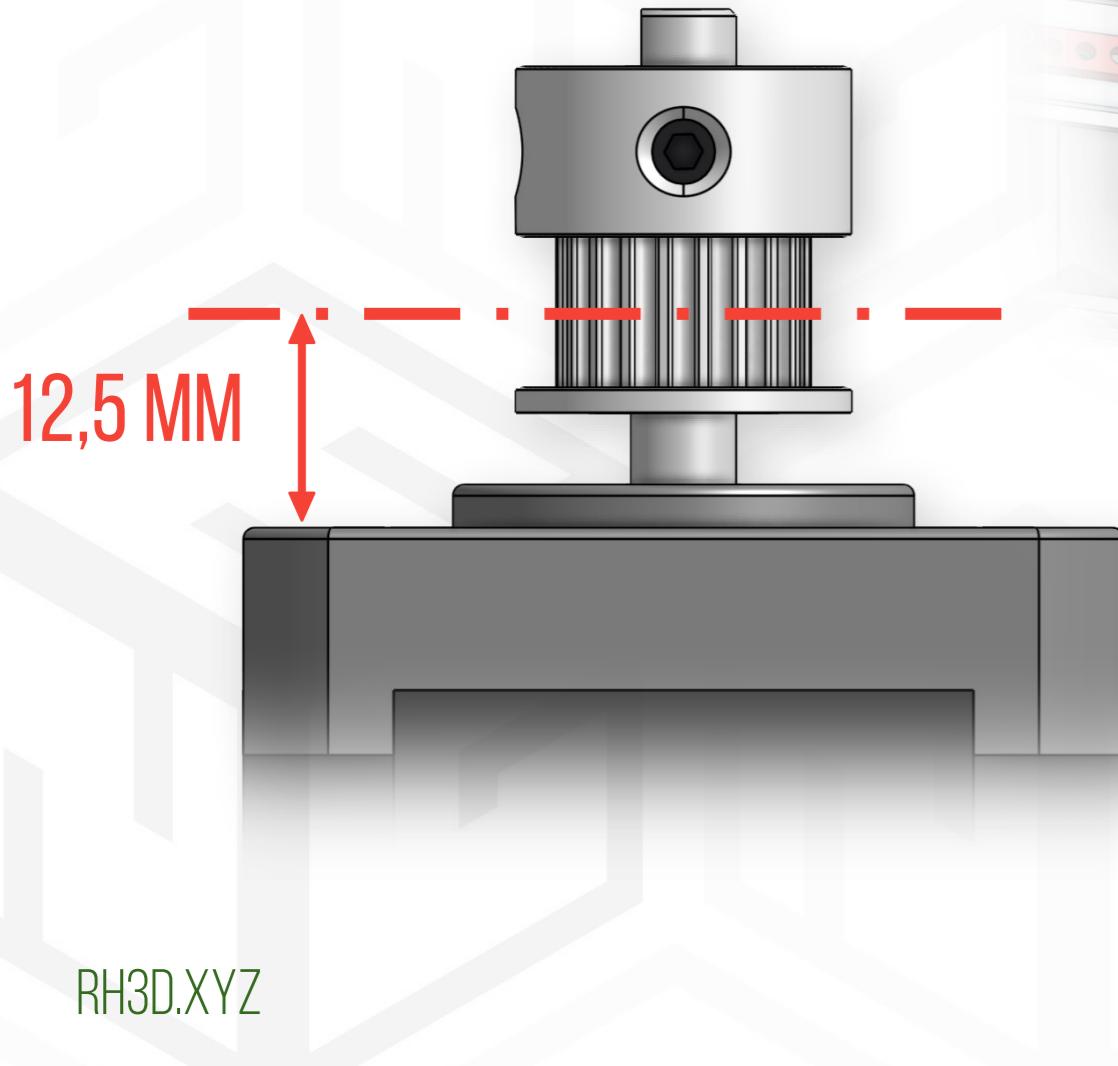
## HARDWARE:

8x M3x25 SHCS (= both sides)  
2x GT2 20T Pulley - 5mm bore (= both sides)  
2x Nema 17 stepper motor (= both sides)

NOTE: SYMMETRY  
Left and right sides are symmetrical. Do the same steps for the other stepper motor.

## TIP: CREALITY STEPPER

You can reuse the stock Creality X and Y stepper motors including the press fit pulleys.



## AB STEPPER COOLING

# AB STEPPER MOTORS INSTALL

### TOOLS:

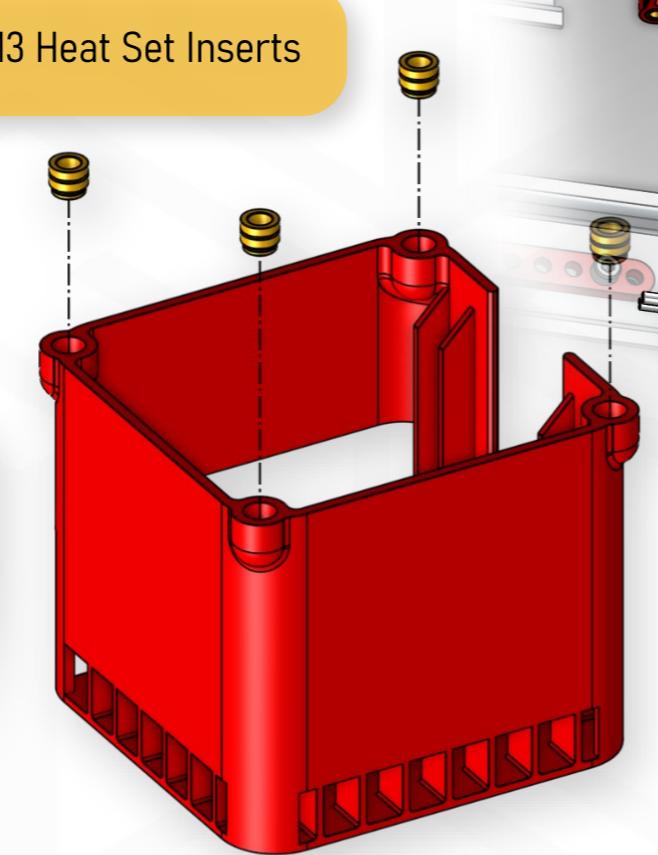
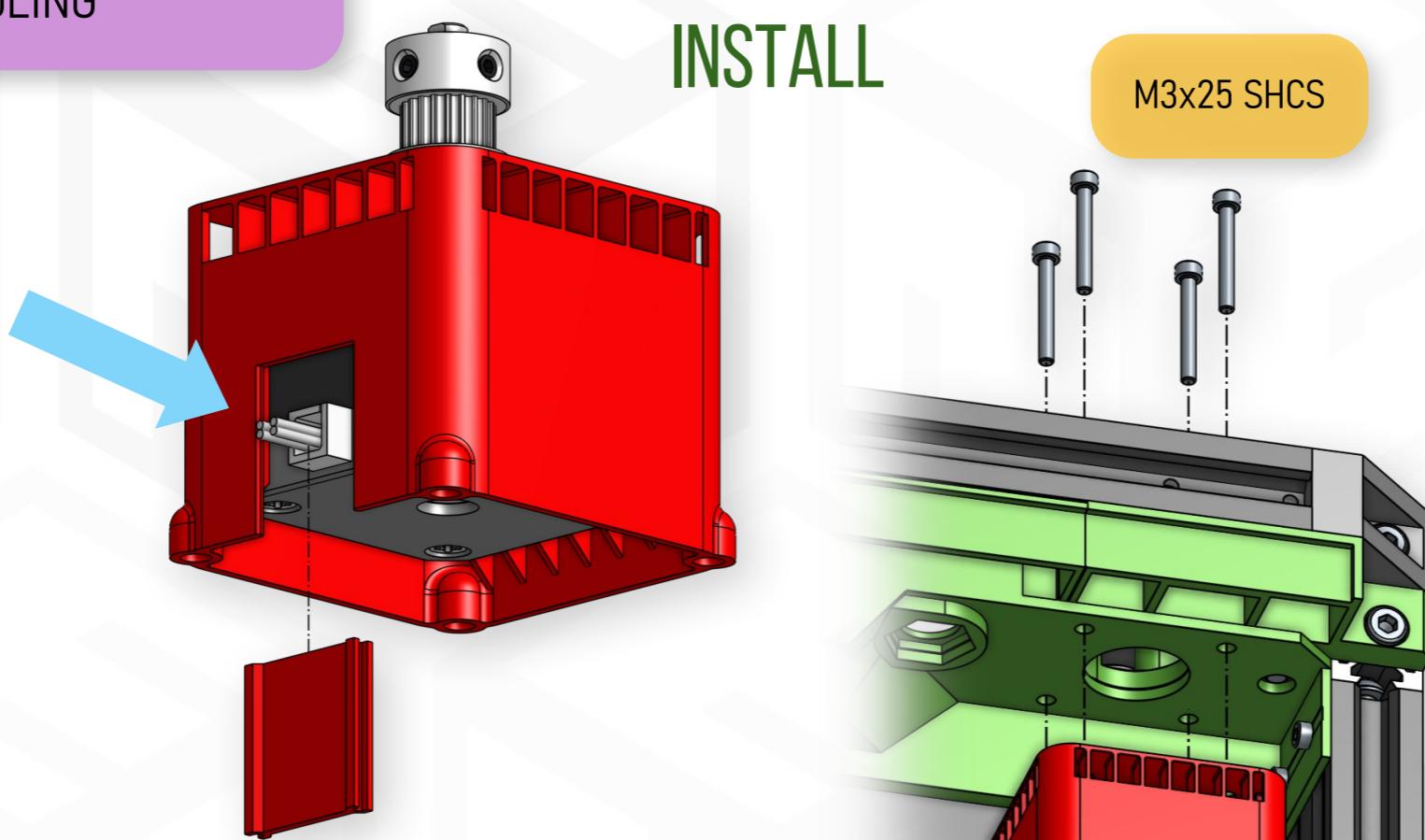
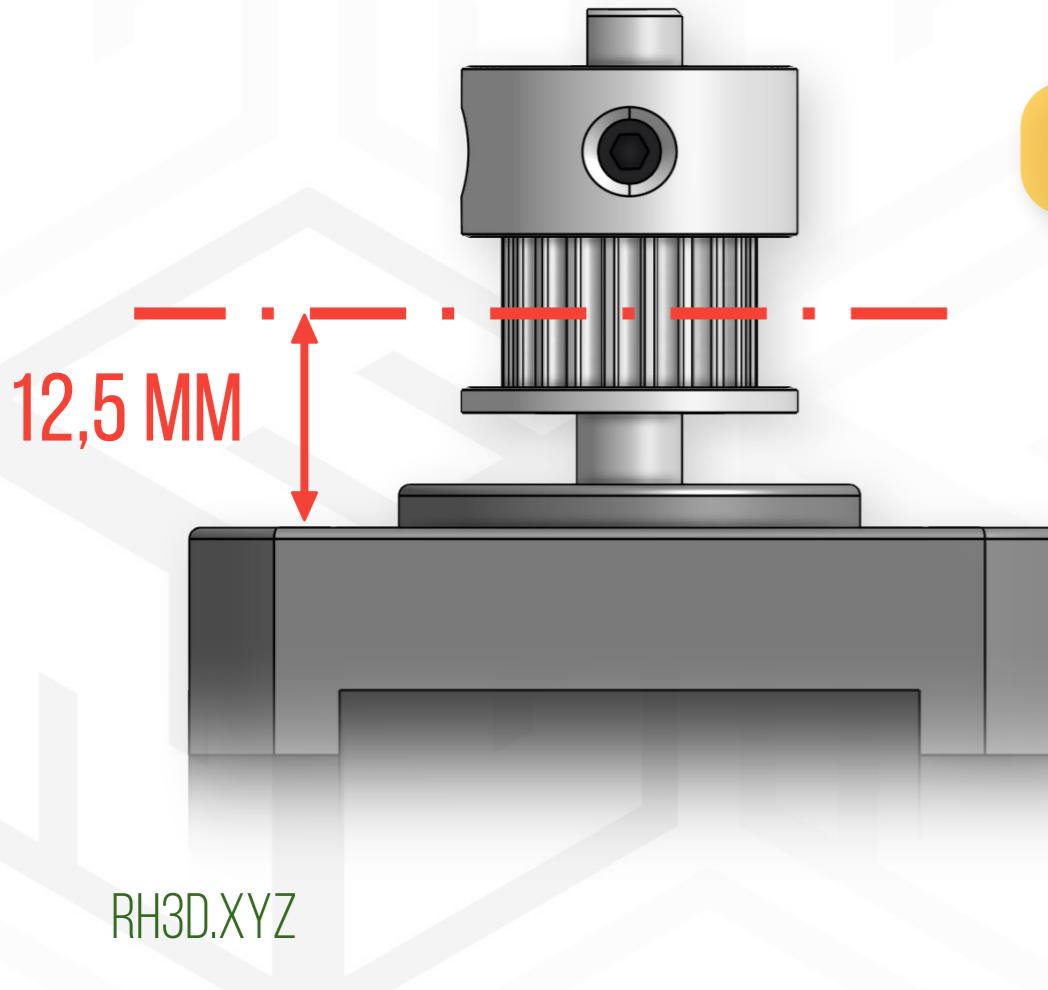
Heat set insert press  
1.5 mm Allen key  
2.5 mm Allen key  
Ruler

### HARDWARE:

8x M3 Heat set insert (= both sides)  
8x M3x25 SHCS (= both sides)  
8x M3x35 SHCS (= both sides)  
2x GT2 20T Pulley - 5mm bore (= both sides)  
2x Nema 17 stepper motor (= both sides)  
2x 4020 axial fan (= both sides)

### PRINTED PARTS:

optional\_stepper\_cooling\_B\_body.stl  
optional\_stepper\_cooling\_A\_body.stl  
optional\_stepper\_cooling\_AB\_transition.stl  
optional\_stepper\_cooling\_AB\_4020.stl  
optional\_stepper\_cooling\_wires.stl



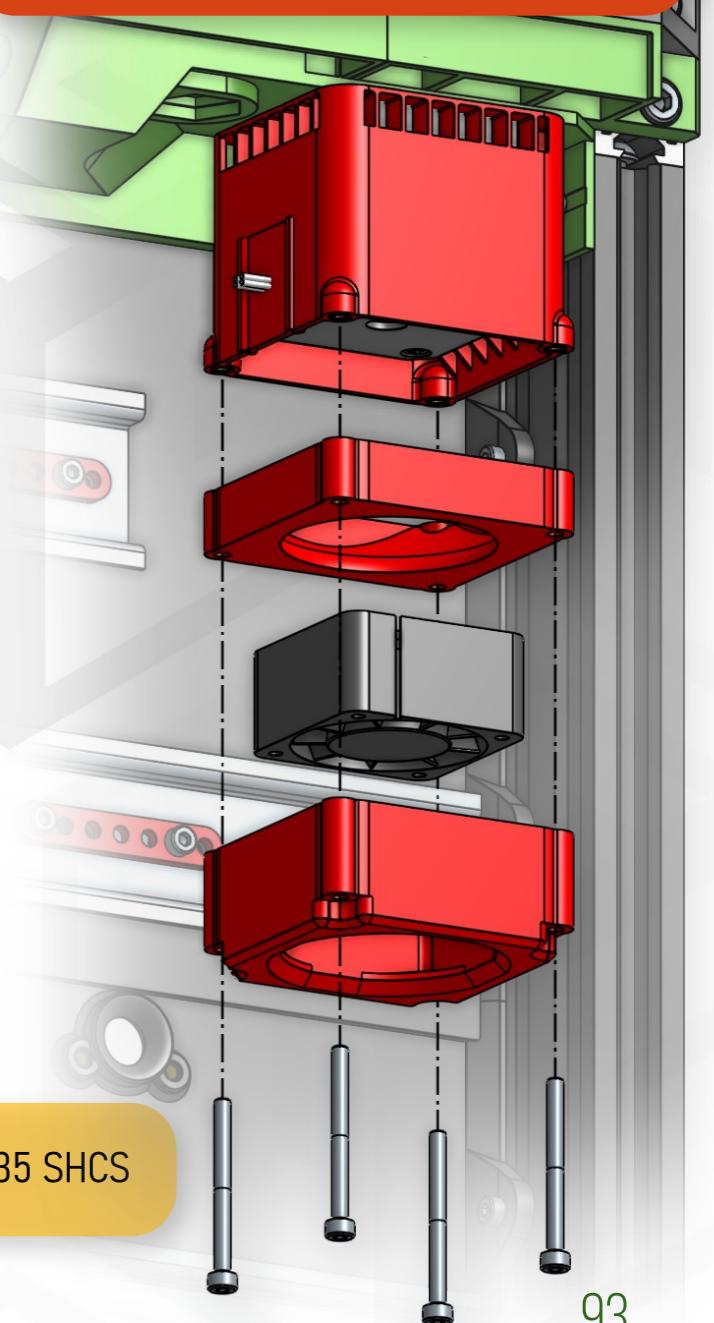
M3x25 SHCS

**NOTE: SYMMETRY**  
Left and right sides are symmetrical. Do the same steps for the other stepper motor.

### TIP: STEPPER WIRES

Test fit the stepper motor into the cooling body, mark the position of wires / connector and trim the small cover piece to cover only the gap around wires as much as possible.

**WARNING: REMOVE SUPPORT**  
Break off the built-in 2 supports marked with X.



# BED CARRIAGE



## STOCK E3 BED

# BED CARRIAGE ARMS

## HEAT SET INSERTS / NUTS INSTALL

### TOOLS:

Heat set insert press

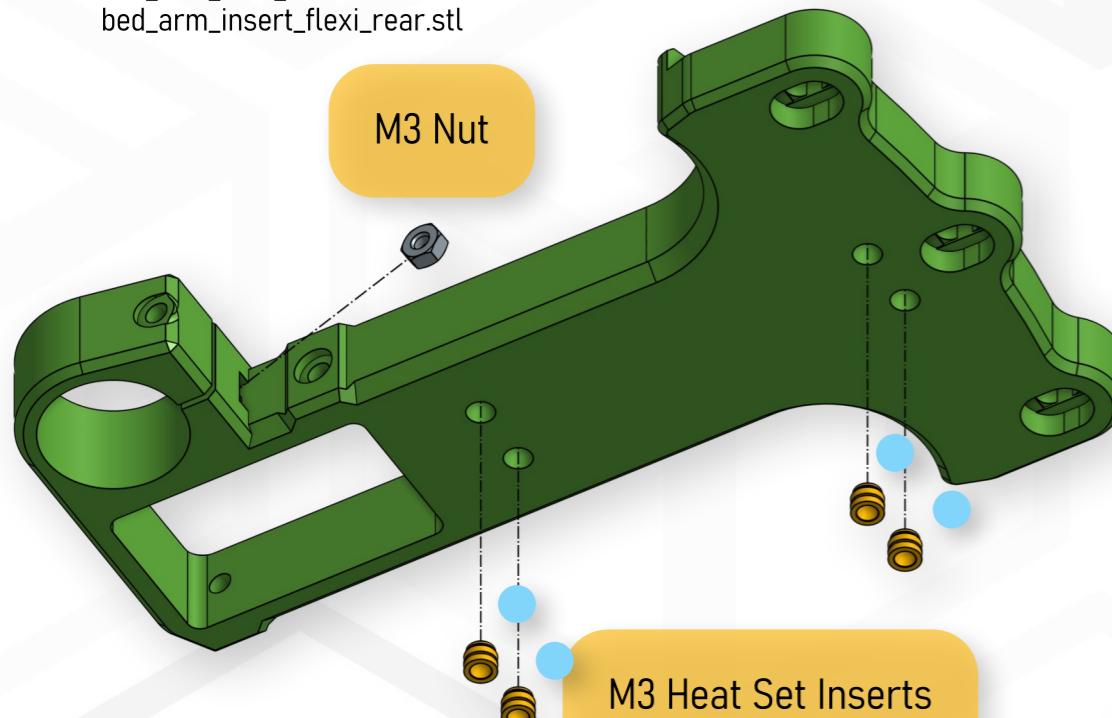
### HARDWARE:

12x M3 Heat insert

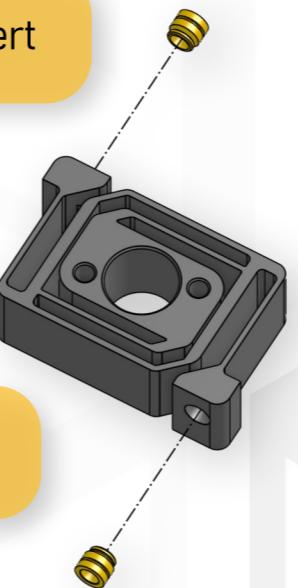
5x M3 Nut

### PRINTED PARTS:

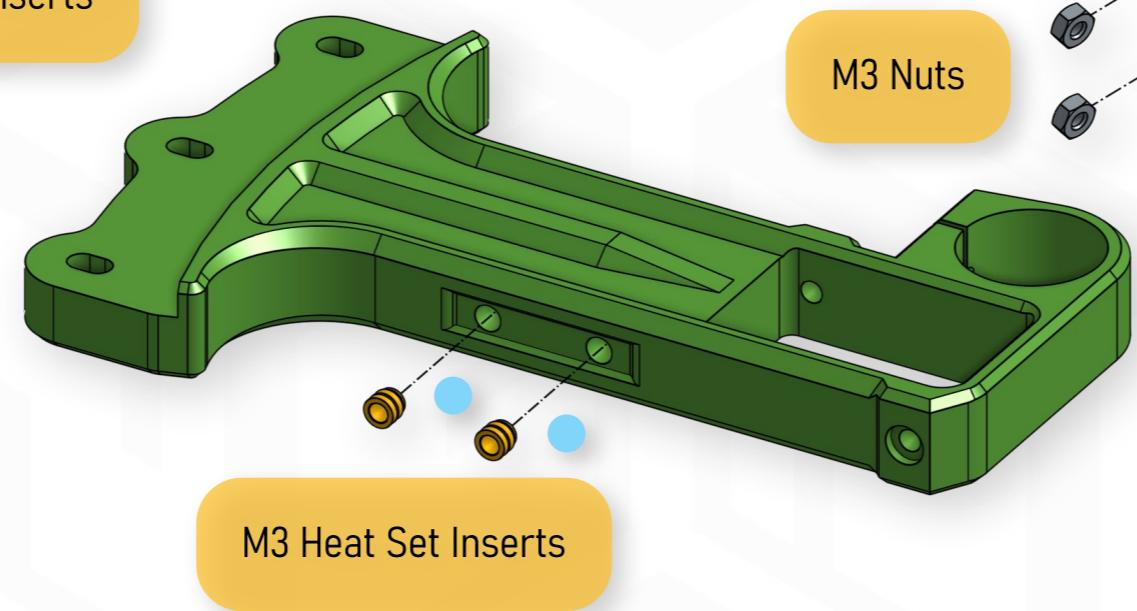
bed\_arm\_left\_flexi.stl  
bed\_arm\_right\_flexi.stl  
bed\_arm\_rear\_flexi.stl  
bed\_arm\_insert\_flexi\_rear.stl



M3 Heat Set Insert



M3 Heat Set Insert



M3 Heat Set Inserts

### NOTE: SYMMETRY

Left and right sides are symmetrical. Do the same steps for the right bed arm.

### TIP: OPTIONS

Marked M3 heat set inserts are for installing bed carriage accessories (currently WAGO mount, Auto Z offset). If you will not use any, you don't need them.

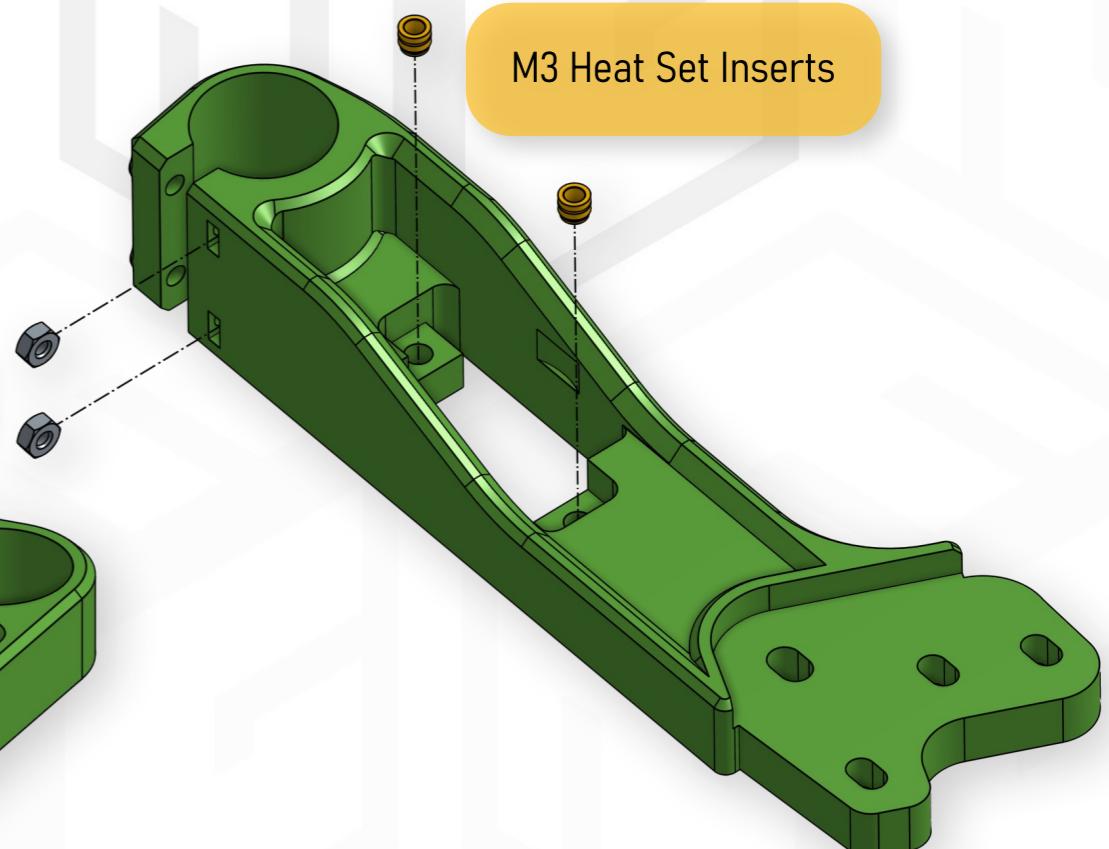
### 2 Z AXIS RODS

For 2 Z axis rods, your rear bed arm will be slightly different and you will not install the M3 nut.

### Z WOBBLE

For different Z wobble compensation, the bed arm is simpler and you will only need to install the T8/8 nut or the WobbleX kit.

M3 Heat Set Inserts



STOCK E3 BED

# BED CARRIAGE INSTALL

## FRONT ARMS

### TOOLS:

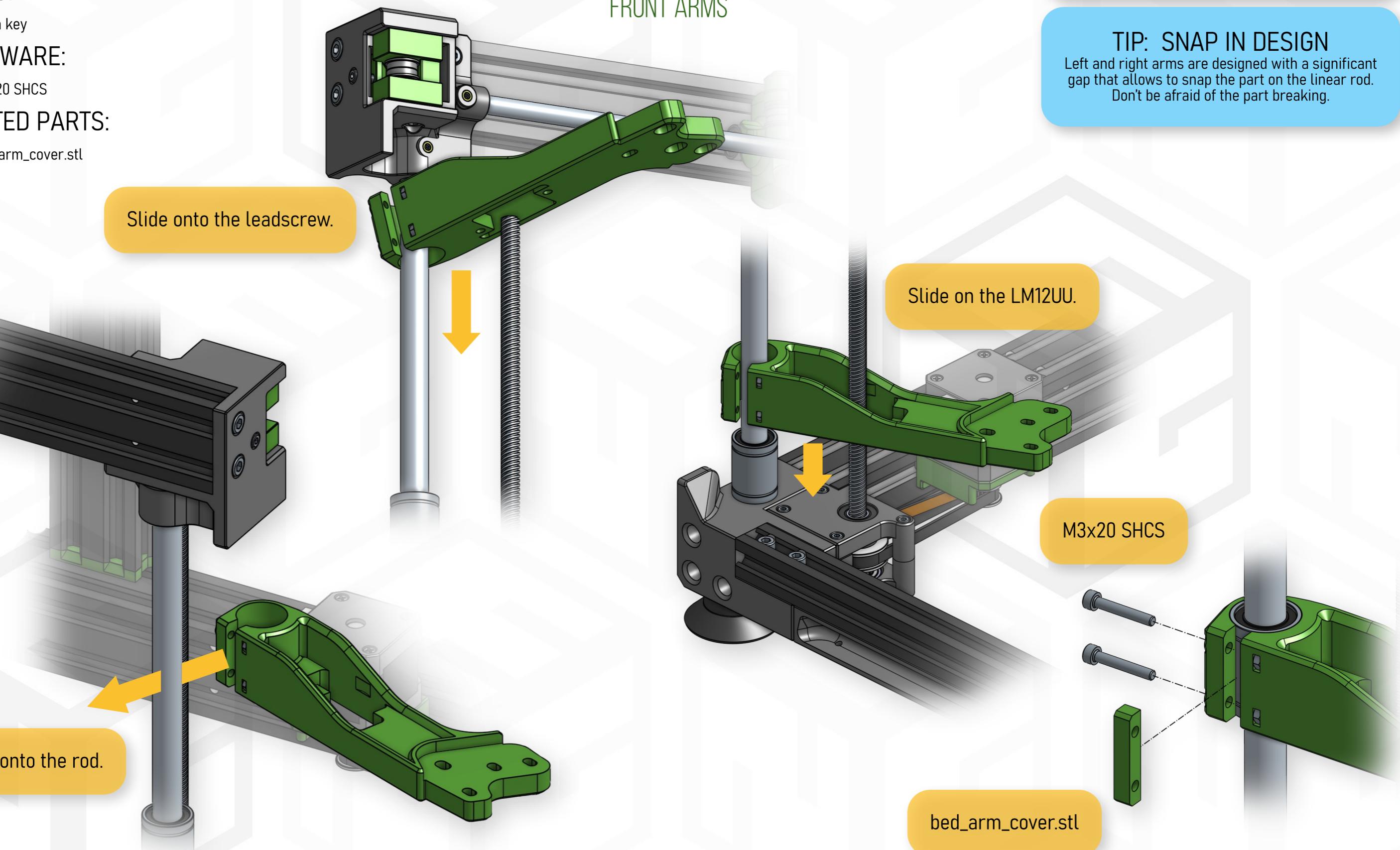
2.5 mm Allen key

### HARDWARE:

5x M3x20 SHCS

### PRINTED PARTS:

2x bed\_arm\_cover.stl



STOCK E3 BED

## BED CARRIAGE INSTALL

### REAR ARM

2 Z AXIS RODS

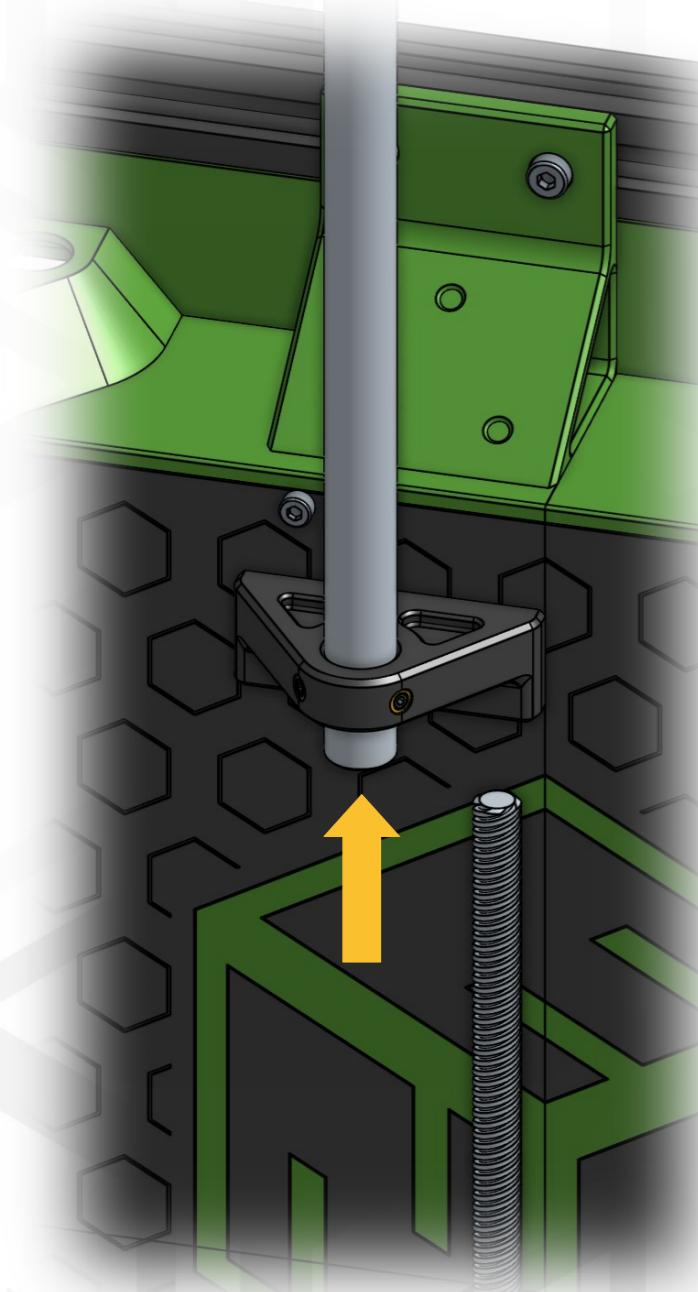
Only slide the rear arm onto the leadscrew.

#### TOOLS:

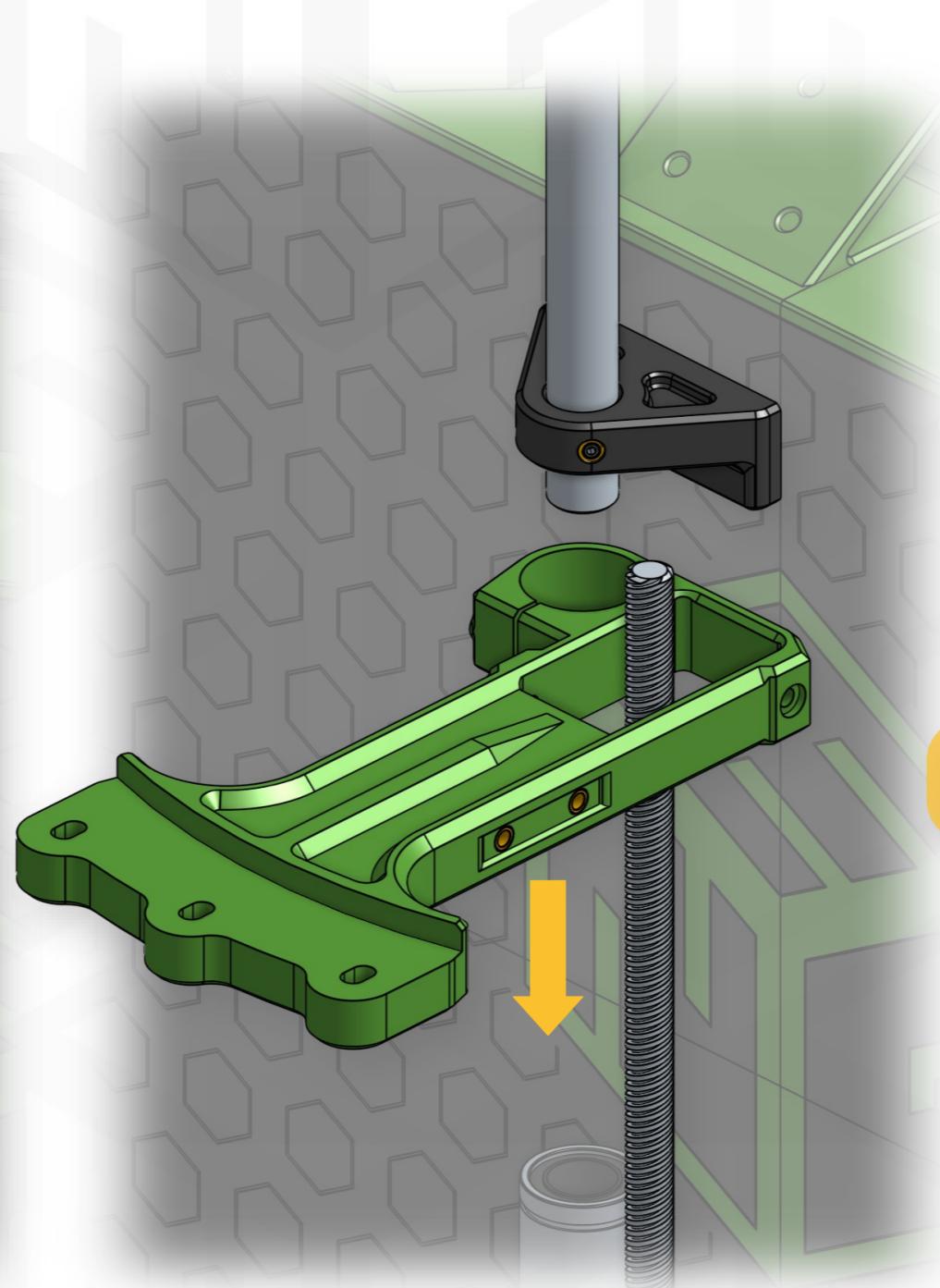
1.5 mm Allen key  
2.5 mm Allen key

#### HARDWARE:

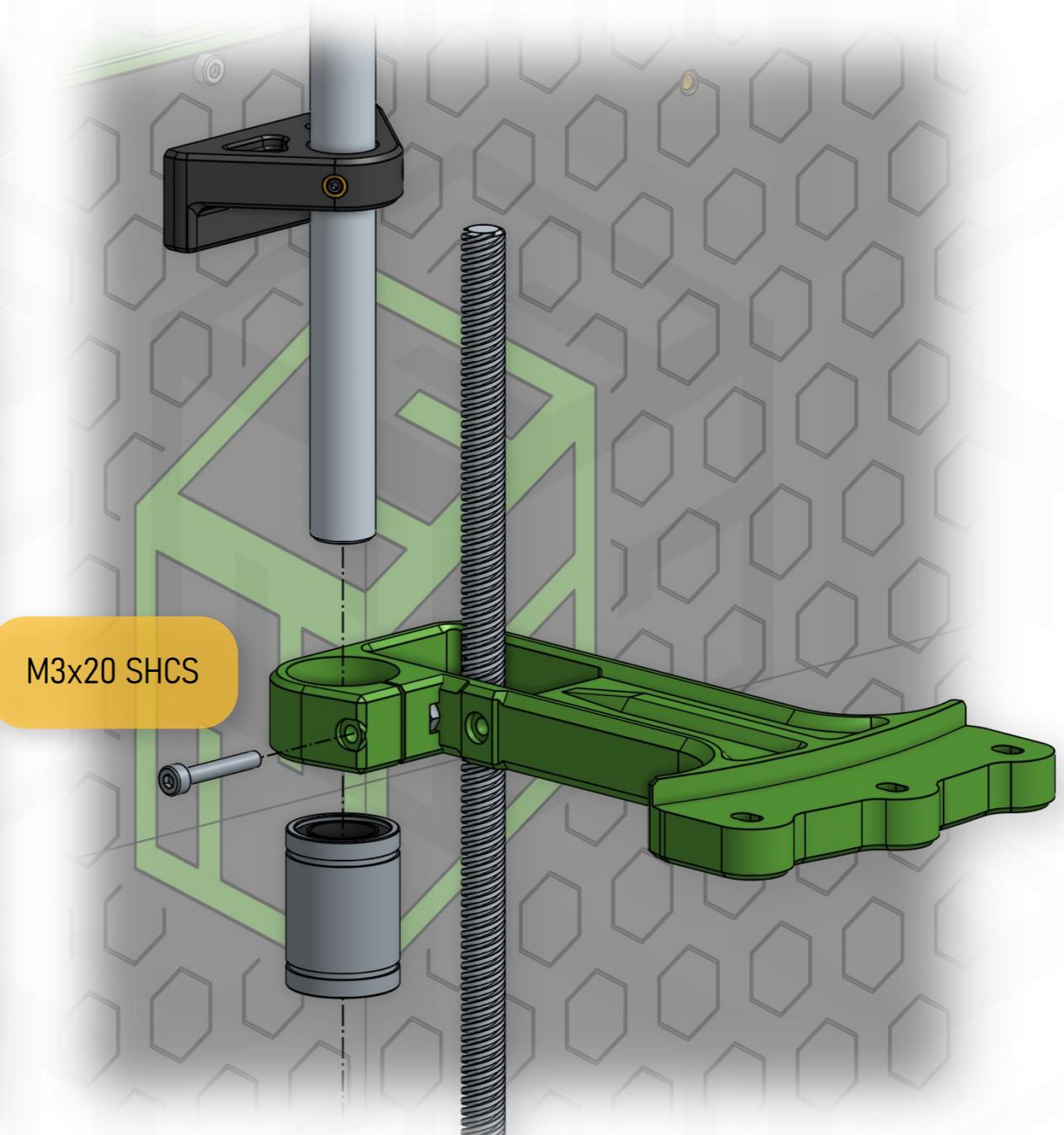
1x M3x20 SHCS



Slide the 12mm rod out partially.



Slide onto the leadscrew.



Align LM12UU with the top face of the bed arm and install the 12mm rod back.

## STOCK E3 BED

### TOOLS:

2.5 mm Allen key

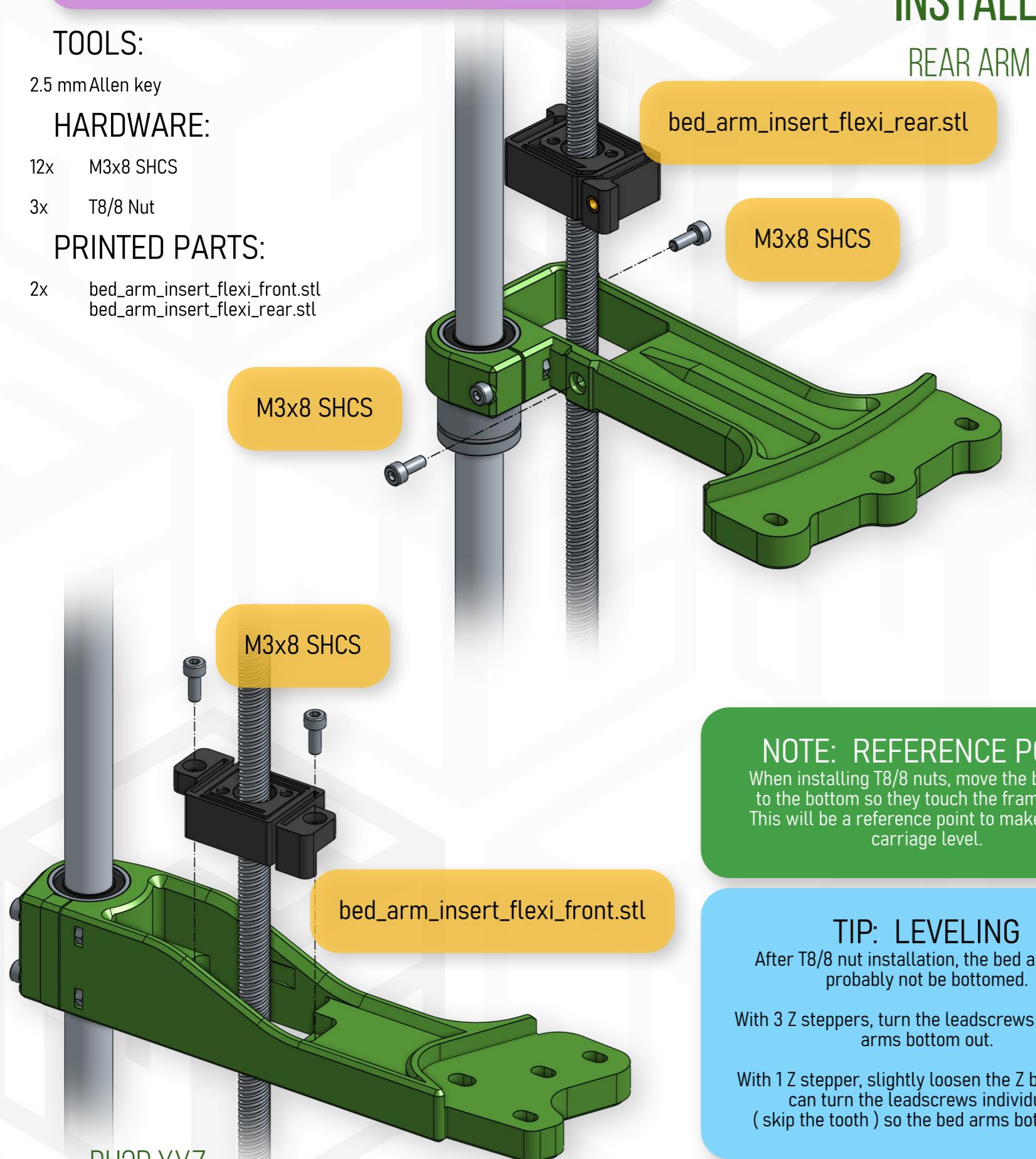
### HARDWARE:

12x M3x8 SHCS

3x T8/8 Nut

### PRINTED PARTS:

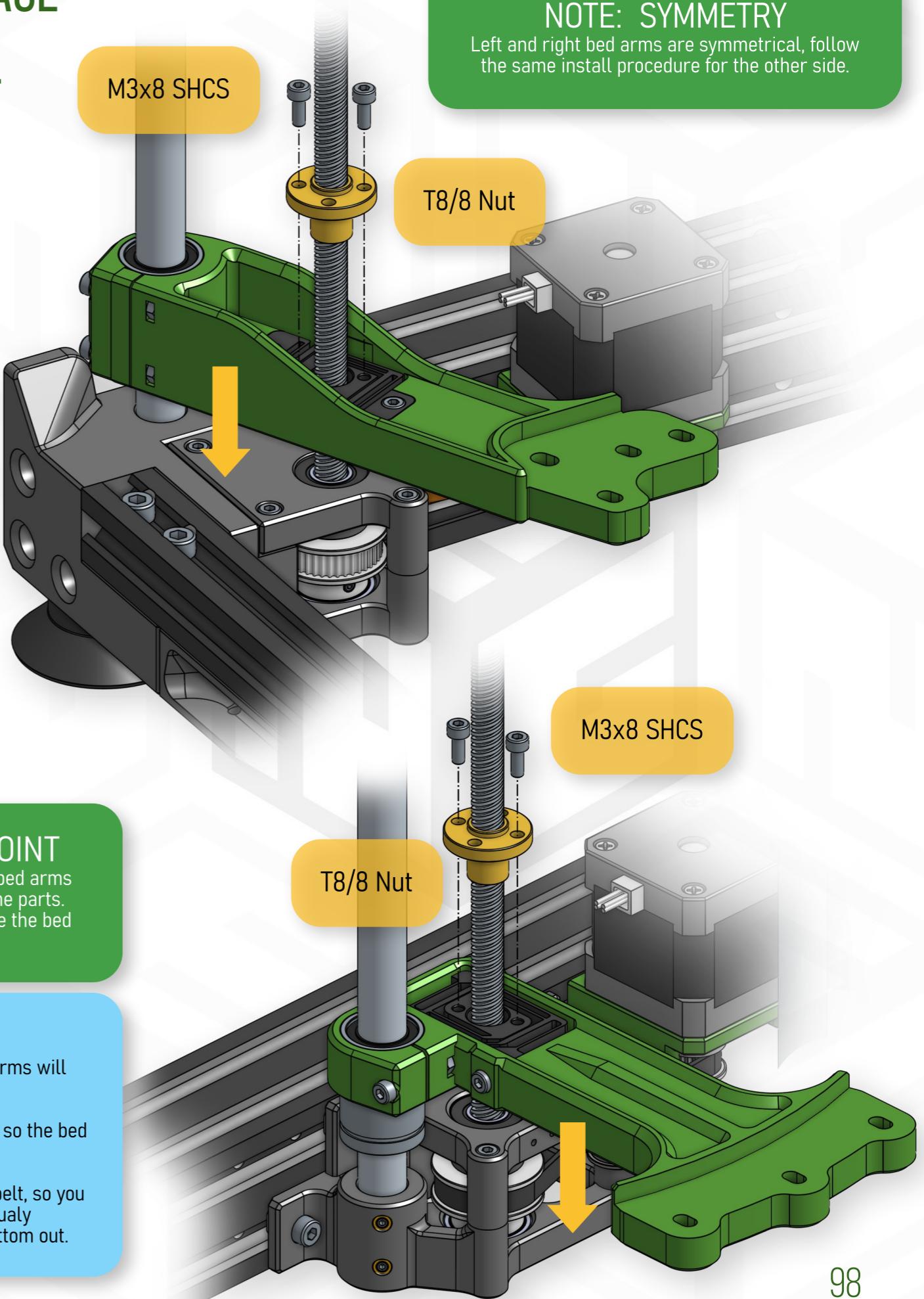
2x bed\_arm\_insert\_flexi\_front.stl  
bed\_arm\_insert\_flexi\_rear.stl



# BED CARRIAGE INSTALL

## REAR ARM

**NOTE: SYMMETRY**  
Left and right bed arms are symmetrical, follow the same install procedure for the other side.



### NOTE: REFERENCE POINT

When installing T8/8 nuts, move the bed arms to the bottom so they touch the frame parts. This will be a reference point to make the bed carriage level.

### TIP: LEVELING

After T8/8 nut installation, the bed arms will probably not be bottomed.

With 3 Z steppers, turn the leadscrews so the bed arms bottom out.

With 1 Z stepper, slightly loosen the Z belt, so you can turn the leadscrews individually (skip the tooth) so the bed arms bottom out.

STOCK E3 BED

TOOLS:

3 mm Allen key

HARDWARE:

9x M4x10 SHCS

# BED CARRIAGE PLATE INSTALL

## WARNING: ORIENTATION

If you plan to install the bed fan, follow the plate orientation ( rear right corner is narrower than rear left ). If not, it doesn't matter.

## NOTE: ALIGNMENT

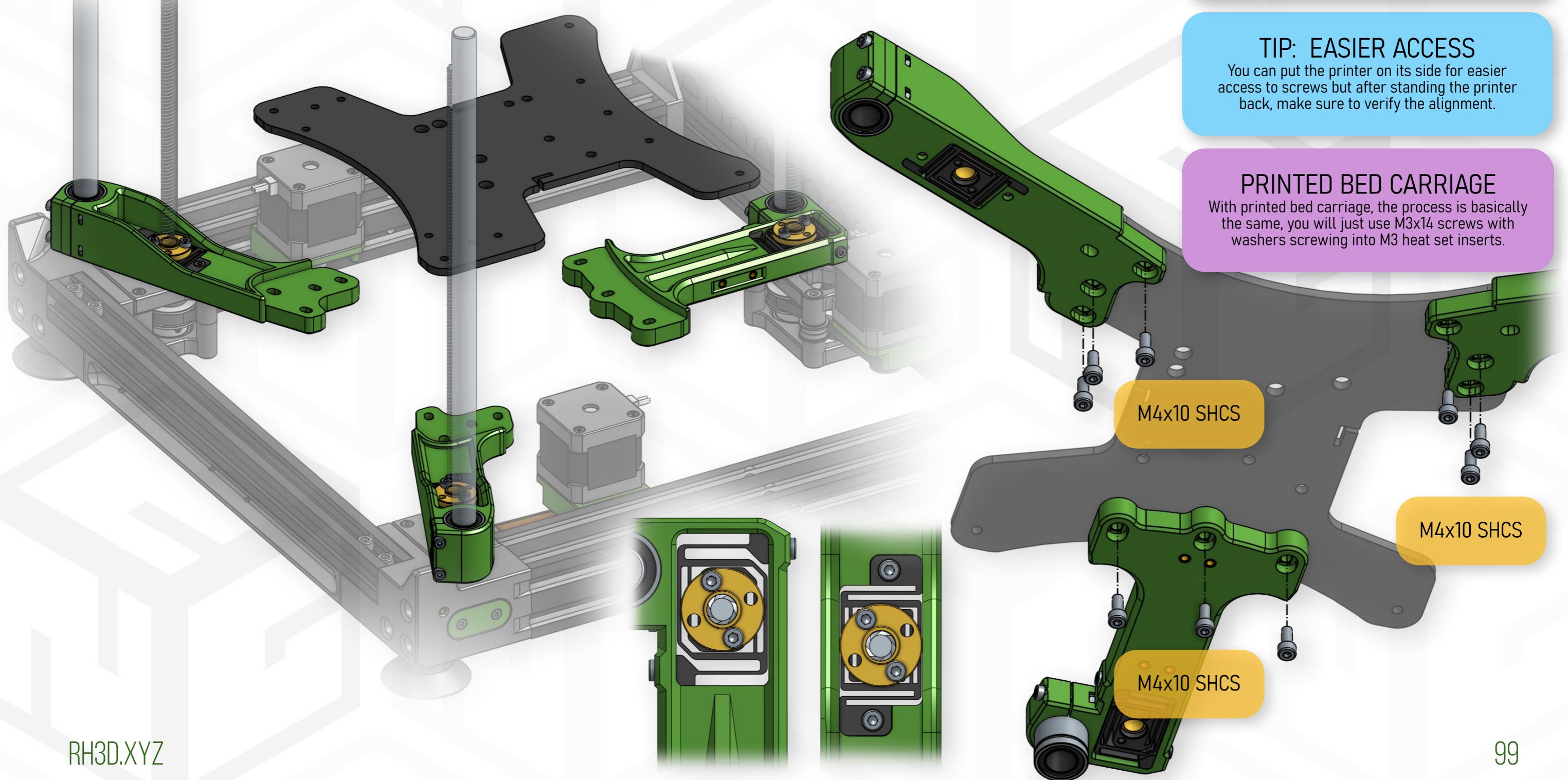
When tightening the bed carriage plate screws, keep the bed at the bottom position and make sure the T8/8 nuts are centered with the leadscrew. Flexi joints – look if the insert is not compressed.

## TIP: EASIER ACCESS

You can put the printer on its side for easier access to screws but after standing the printer back, make sure to verify the alignment.

## PRINTED BED CARRIAGE

With printed bed carriage, the process is basically the same, you will just use M3x14 screws with washers screwing into M3 heat set inserts.



# BED CARRIAGE AIR CIRCULATION FAN

## BED FAN

### TOOLS:

Heat set insert press  
2.5 mm Allen key

### HARDWARE:

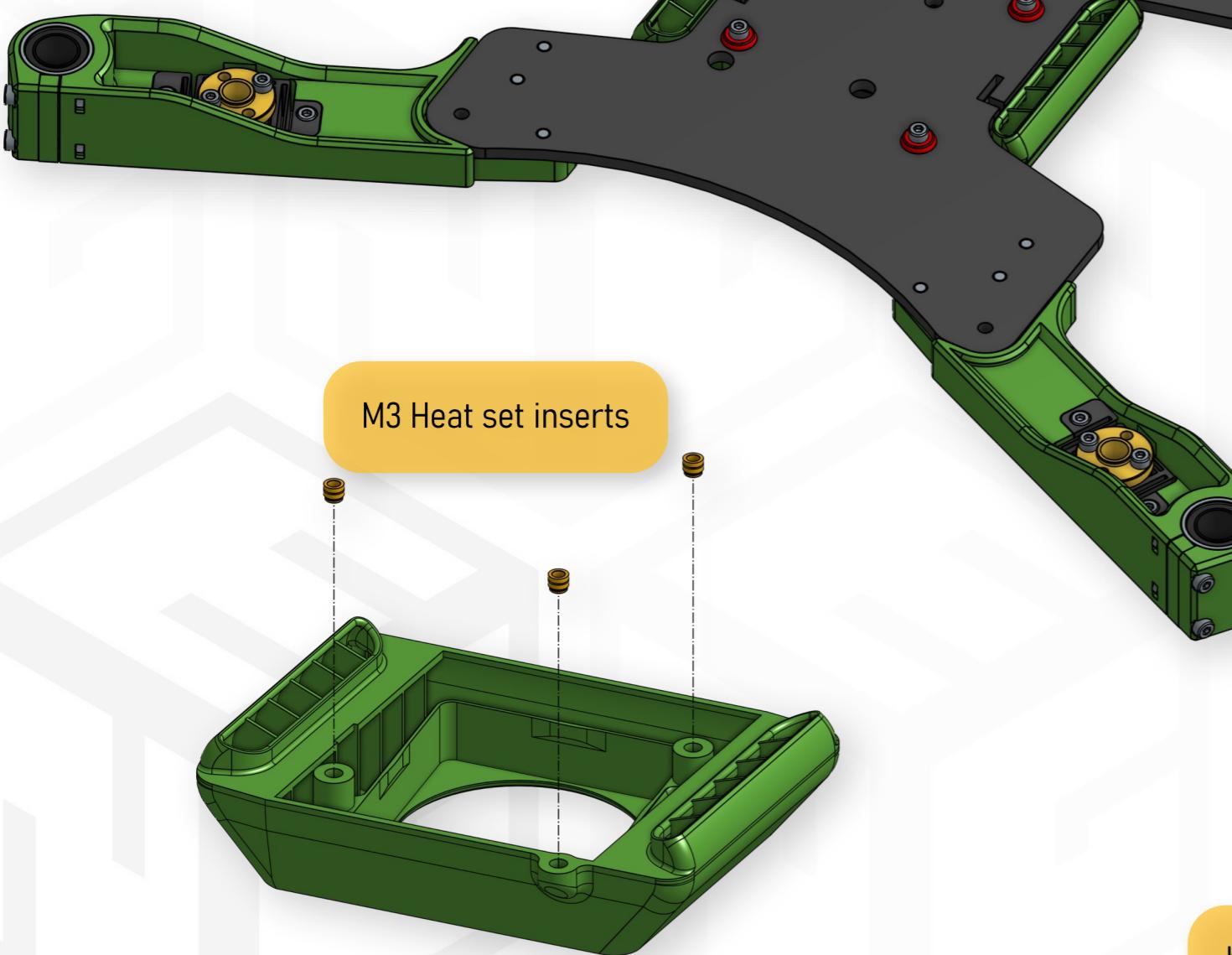
3x M3 Heat set insert

3x M3x10 SHCS

6015 axial fan

### PRINTED PARTS:

2x bed\_fan\_6015\_01.stl  
bed\_fan\_6015\_02.stl  
bed\_fan\_6015\_03.stl



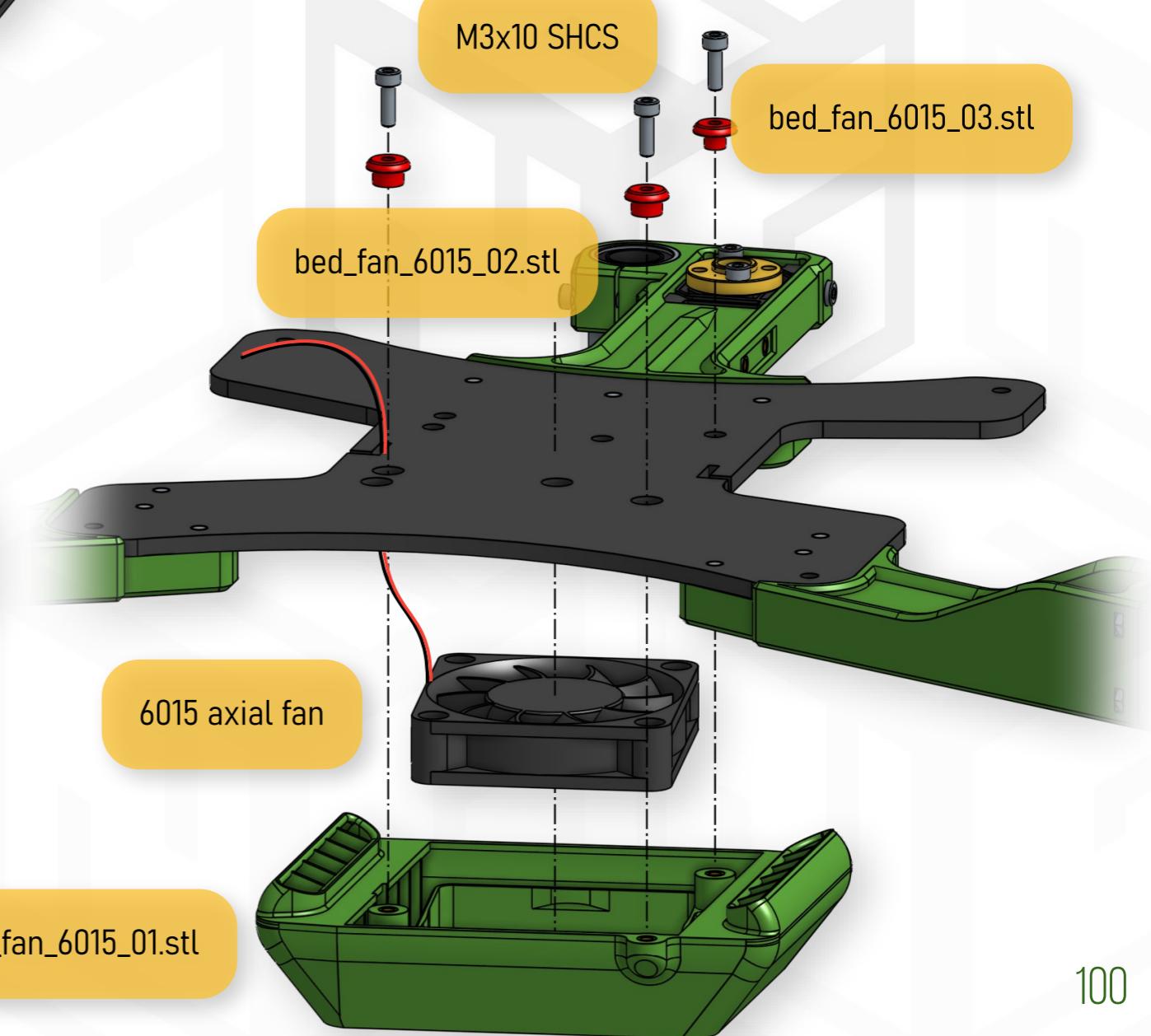
**WARNING: FAN ORIENTATION**  
It is important to install the bed fan so it is sucking air from below the bed and blowing it down. Otherwise it will cool the bed/thermistor too rapidly and cause thermal runaway.

### TIP: WIRES

Orient the fan so the wires are in the position as shown in the picture. Run the wires out through the small cutout and the original belt slot.

### BED CARRIAGE VERSIONS

For other bed carriage versions, install the 6015 fan directly with 2x M5x12 SHCS.



## BED WAGO MOUNT

### TOOLS:

Soldering Iron + solder + flux + wire  
2.5 mm Allen key

### HARDWARE:

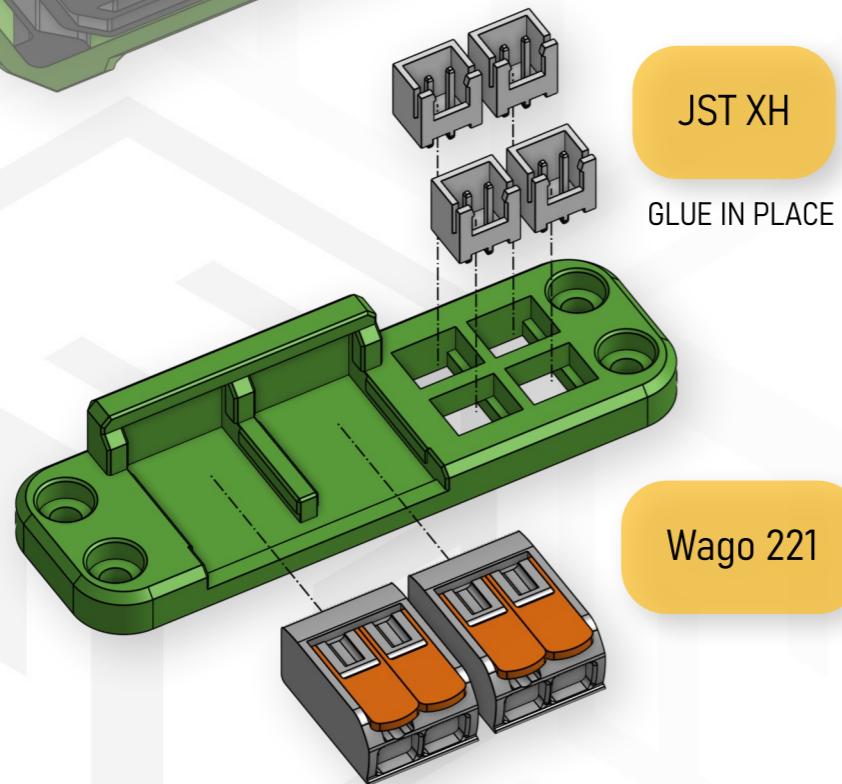
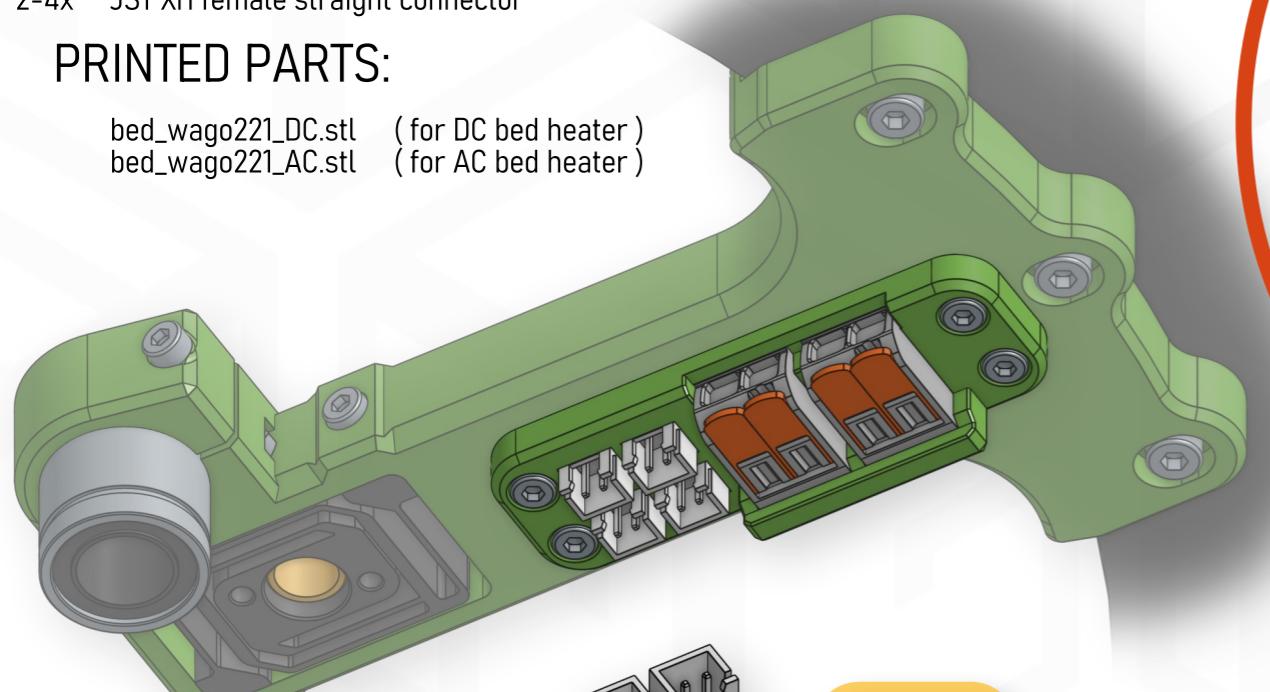
4x M3x6 SHCS

2-3x WAGO 221

2-4x JST XH female straight connector

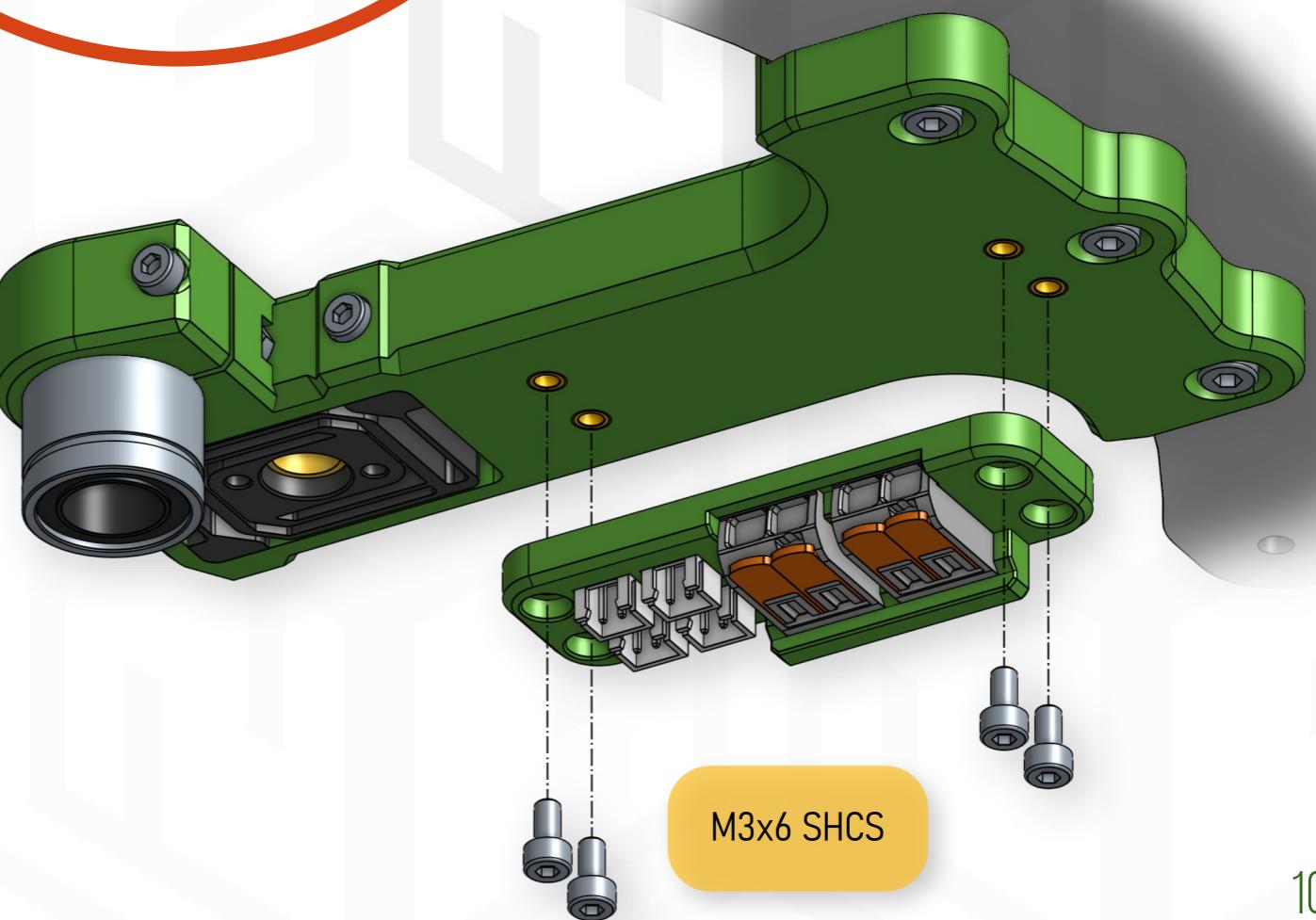
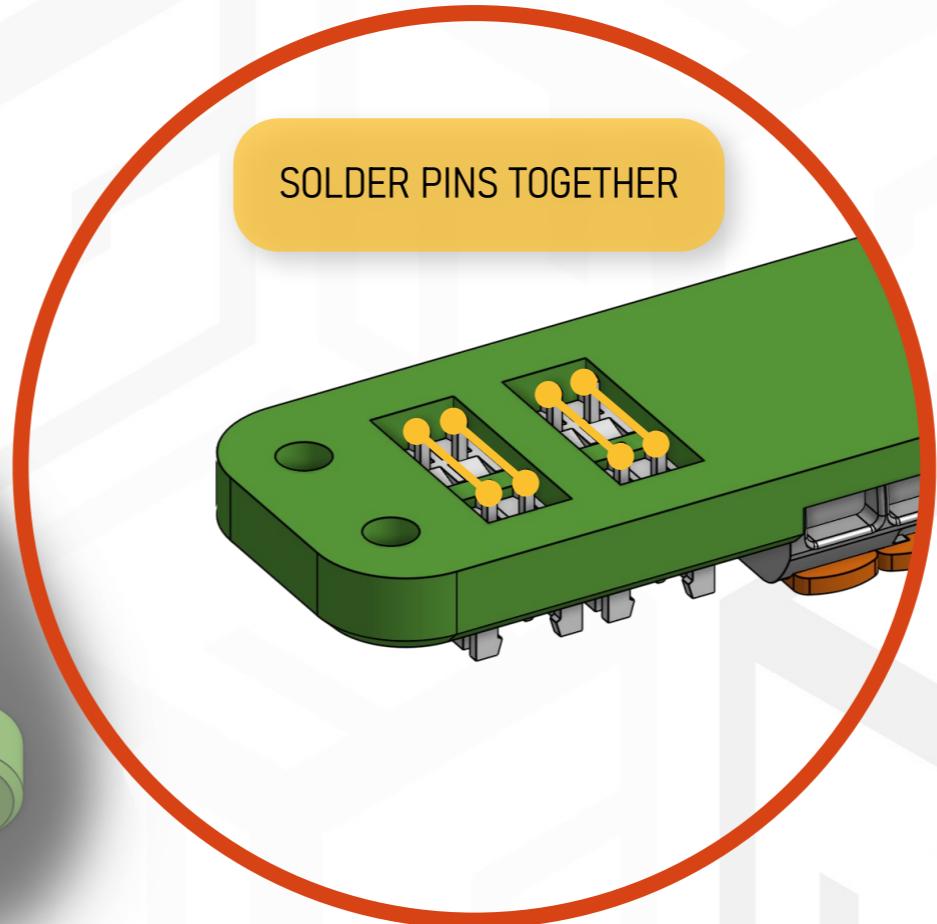
### PRINTED PARTS:

bed\_wago221\_DC.stl (for DC bed heater)  
bed\_wago221\_AC.stl (for AC bed heater)



# BED CARRIAGE WAGO CONNECTORS

SOLDER PINS TOGETHER



### WARNING: HIGH VOLTAGE

If you decide to use AC heater on your bed, you need to properly ground the bed plate. Keep in mind that working with AC is extremely dangerous and if not handled properly, it can cause fire, serious injuries or even death.

When working with AC, follow your local regulations and if needed, leave the work to professionals.

### AC vs DC BED HEATER

Both versions differ only with the amount of WAGO and JST XH connectors needed, the installation procedure is the same.

# BED CARRIAGE BED PLATE

## TOOLS:

2.5 mm Allen key

## HARDWARE:

2x M3x8 SHCS

2x Ziptie

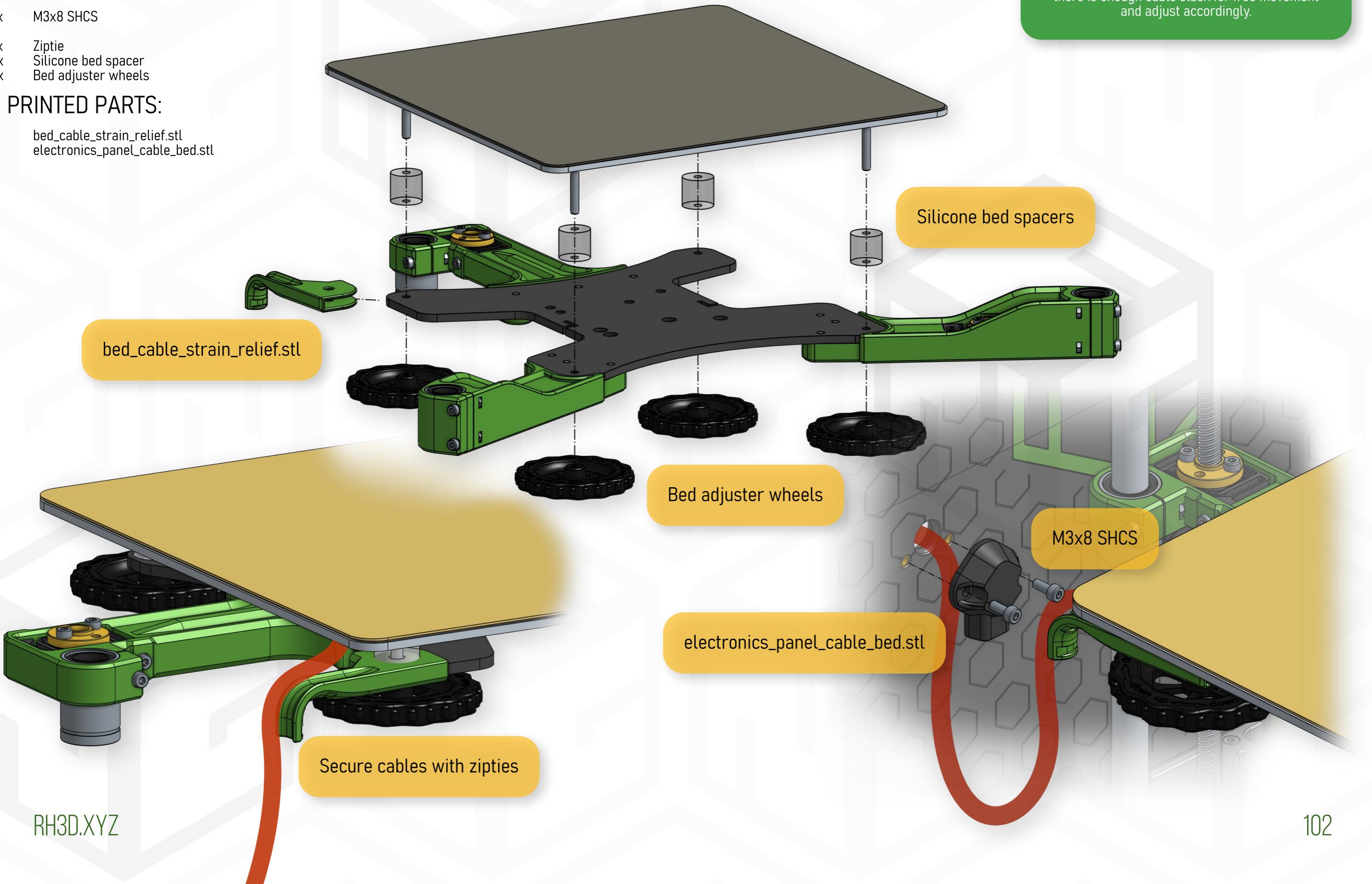
4x Silicone bed spacer

4x Bed adjuster wheels

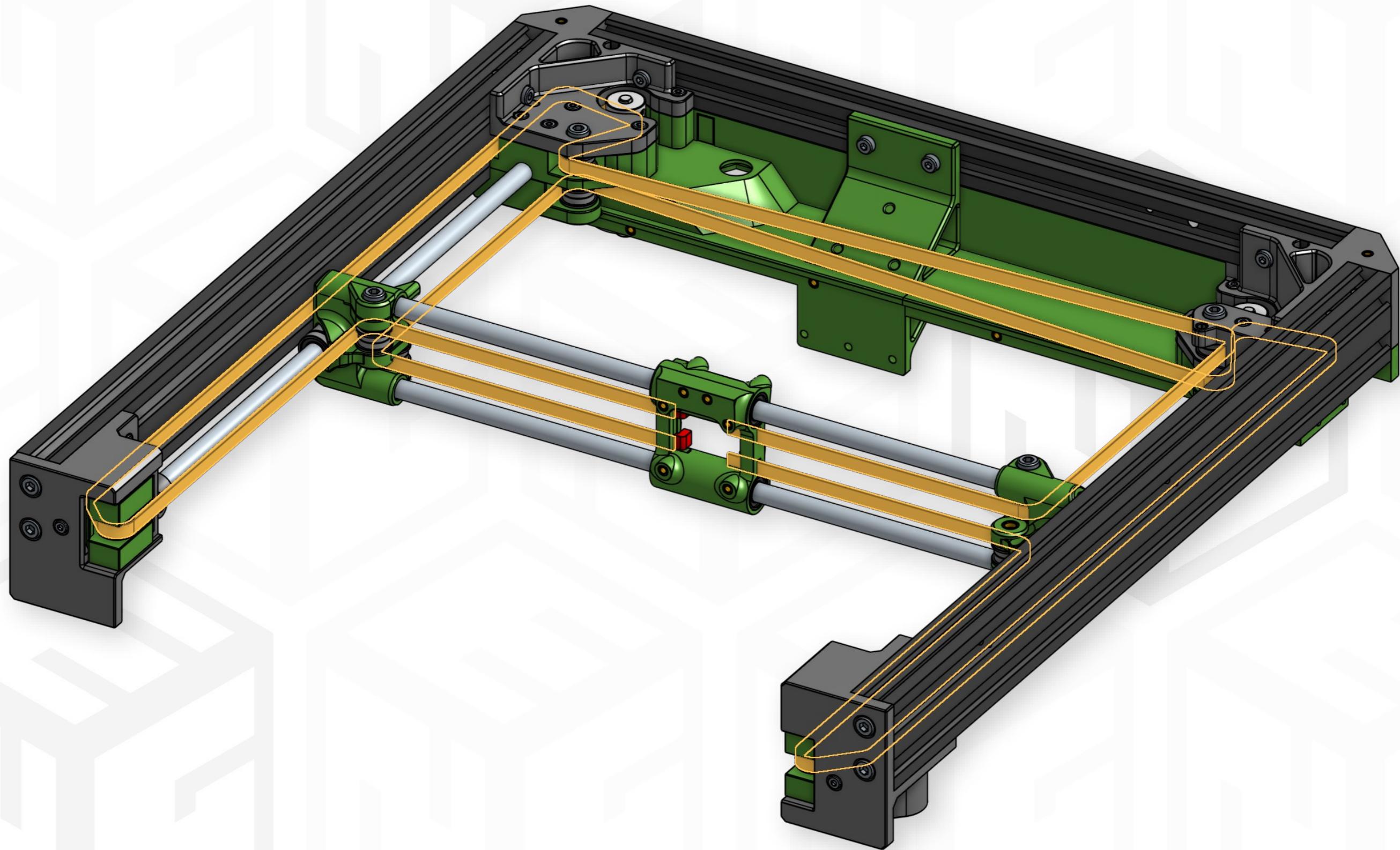
## PRINTED PARTS:

bed\_cable\_strain\_relief.stl  
electronics\_panel\_cable\_bed.stl

**NOTE: WIRE LENGTH**  
When installing the bed wire cover on the panel, test the bed lowest and highest position to check there is enough cable slack for free movement and adjust accordingly.



# AB BELTS



# AB BELTS GUIDANCE

## TOOLS:

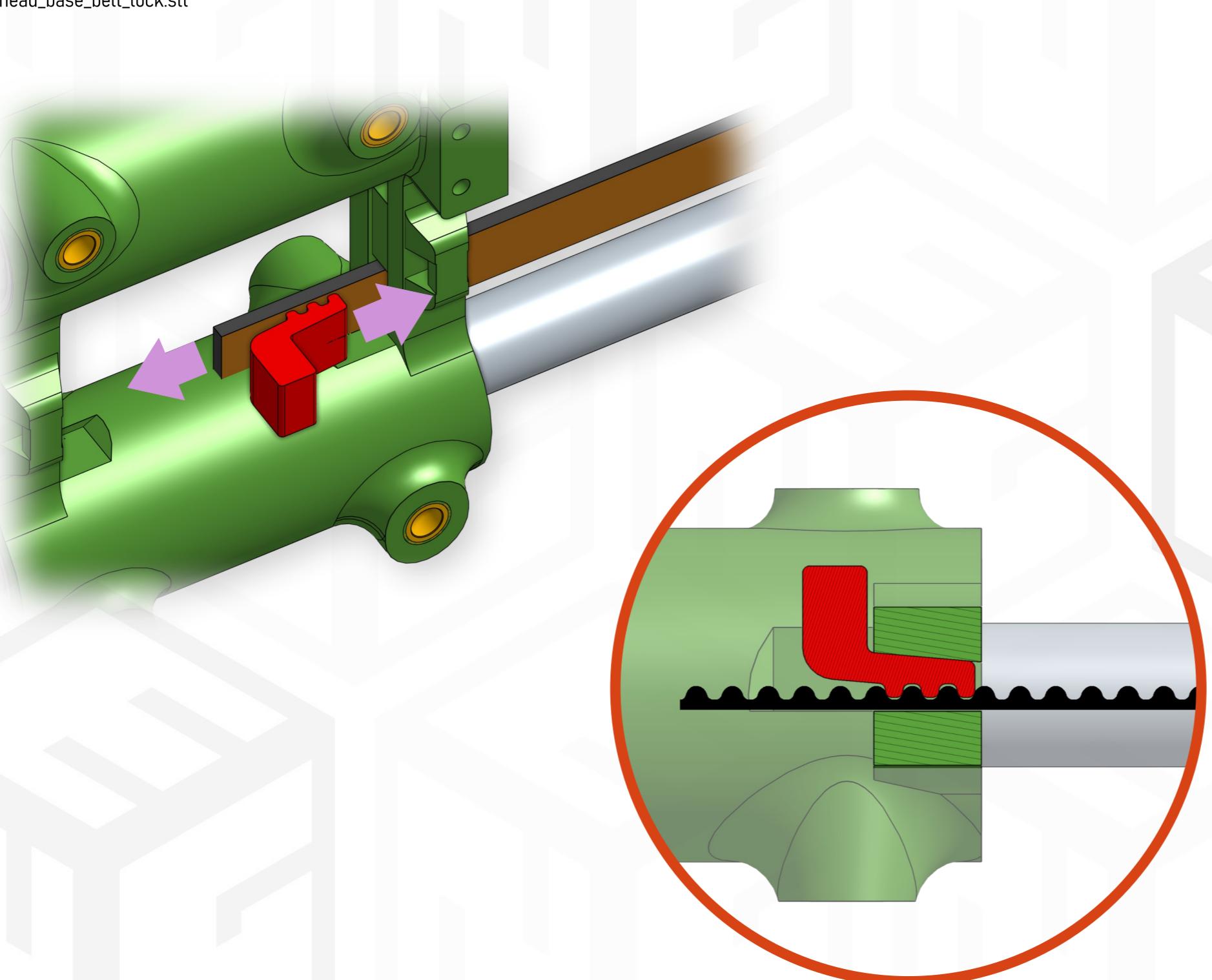
2.5 mm Allen key

## HARDWARE:

2x 1.5 m GT2 6mm belt (1.45 m is the absolute minimum)

## PRINTED PARTS:

4x toolhead\_base\_belt\_lock.stl



## WARNING: EQUAL LENGTH

Put emphasis on measuring the belt length and installation process to be sure both belts are equal length ( tooth count ) and are installed the same way.

## WARNING: TENSIONERS

When installing the belt, keep the belt tensioners loosened all the way.

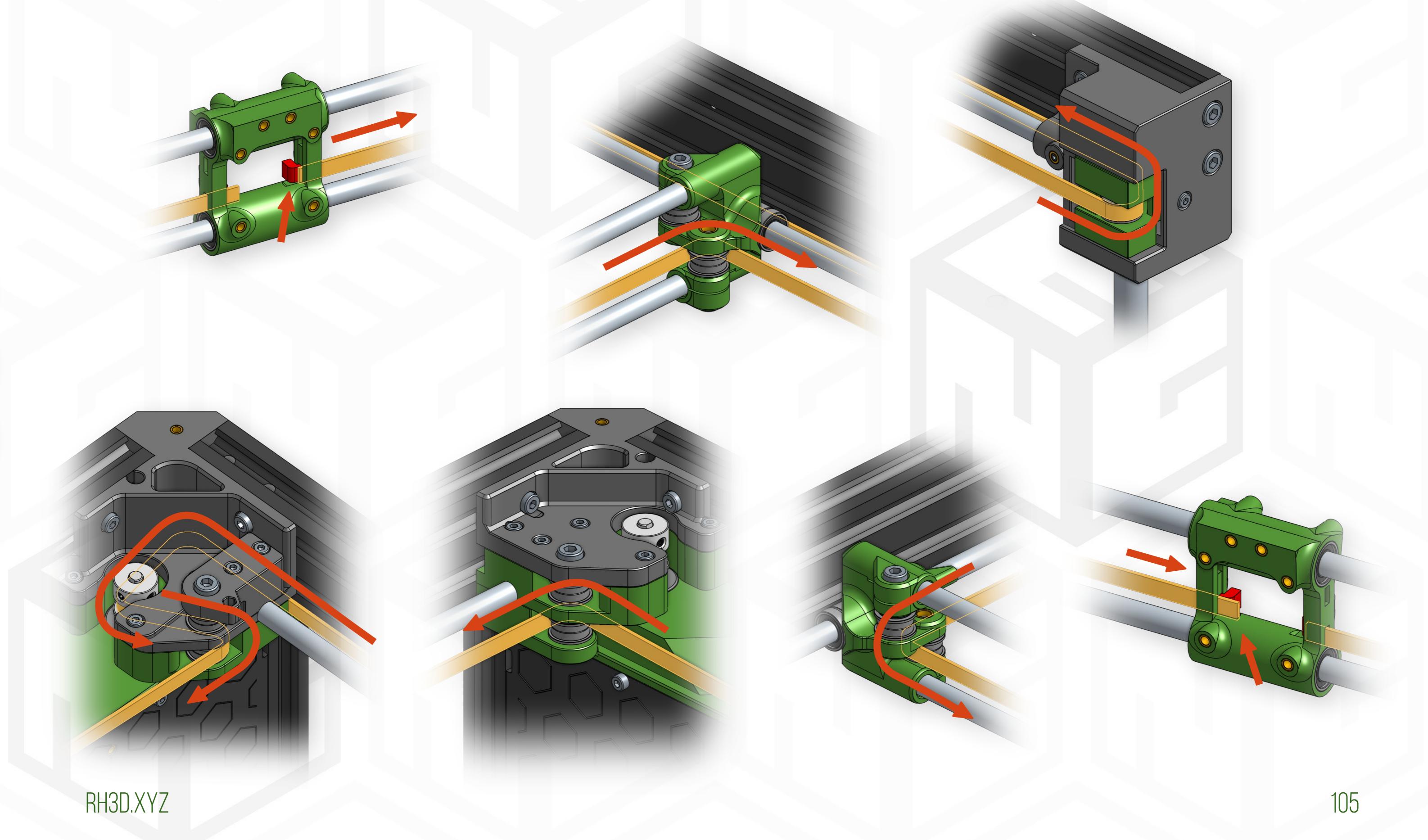
## TIP: TOOLHEAD BELT

- 1) The belt lock and the corresponding hole have tapered faces so the more the belt is tensioned, the more it locks itself in and when installing you don't need to push it in with a lot of force.
- 2) The belt end you insert first into the toolhead should be in just the minimal amount so when you route the belt and insert the other end, you will have more to grab onto.
- 3) The easiest way to secure the belt into the toolhead is to pull the belt end from one side (front) and install the belt lock from the other side (rear).

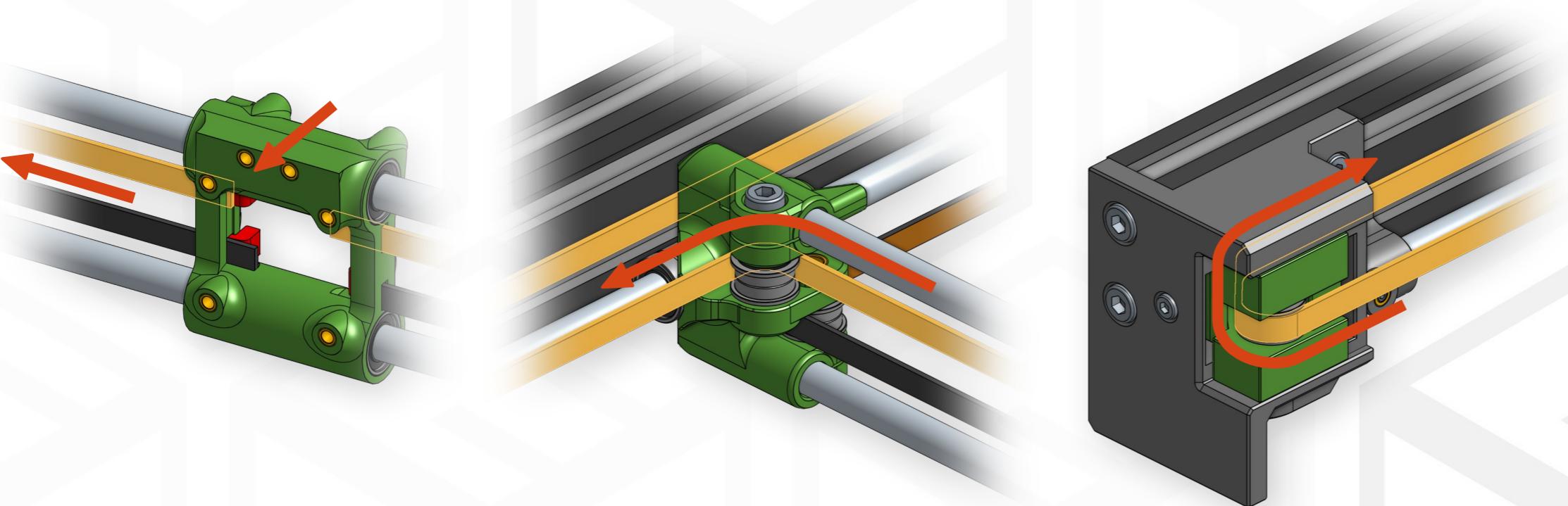
## TIP: BELT PATH

The belt path is well defined by the parts shape to allow for easy install in places, where you can't see. The belt should be easily guided when just pushed in. If the belt gets stuck, it might be going onto the F695 flange so try going in and out few times until it sits properly.

## AB BELTS A BELT ( RIGHT )



## AB BELTS B BELT ( LEFT )

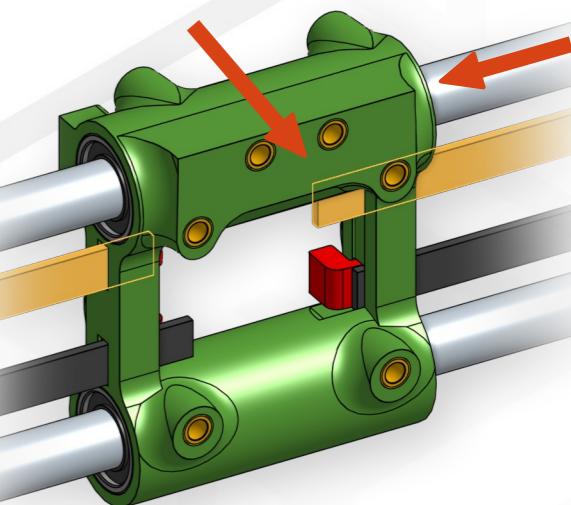
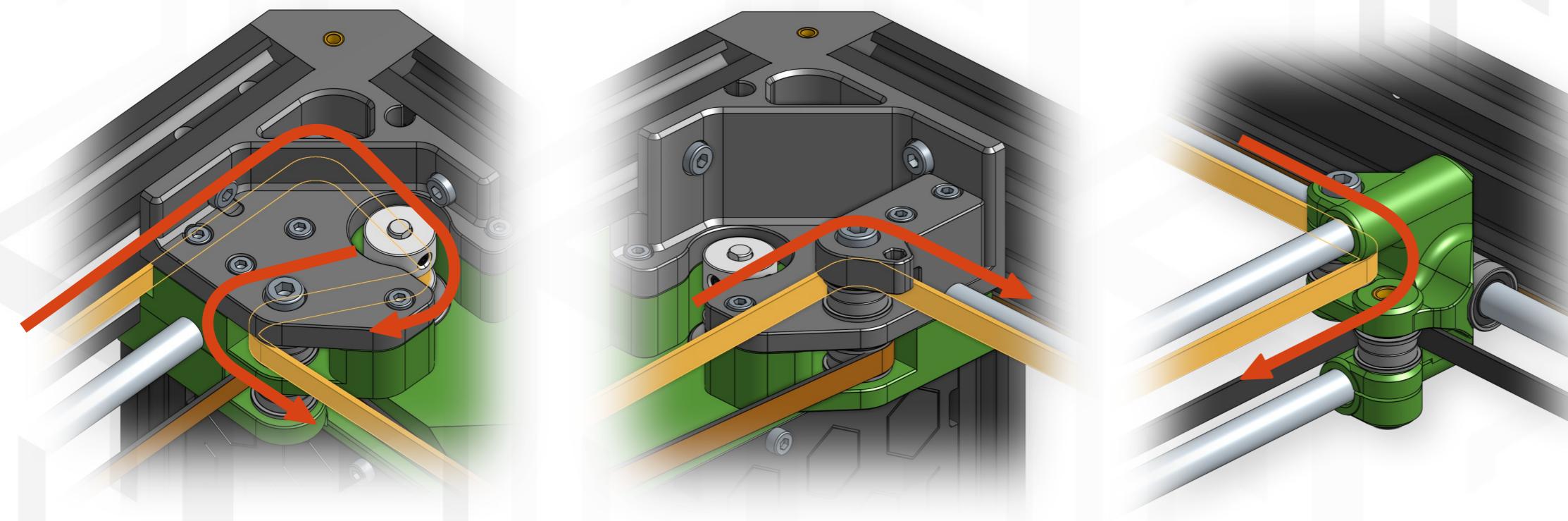


**WARNING: EQUAL LENGTH**  
Make sure the exposed belt ends are the same overall length for both B and A belts. It is very crucial to have the same belt length to achieve the best printing results and calibrations.

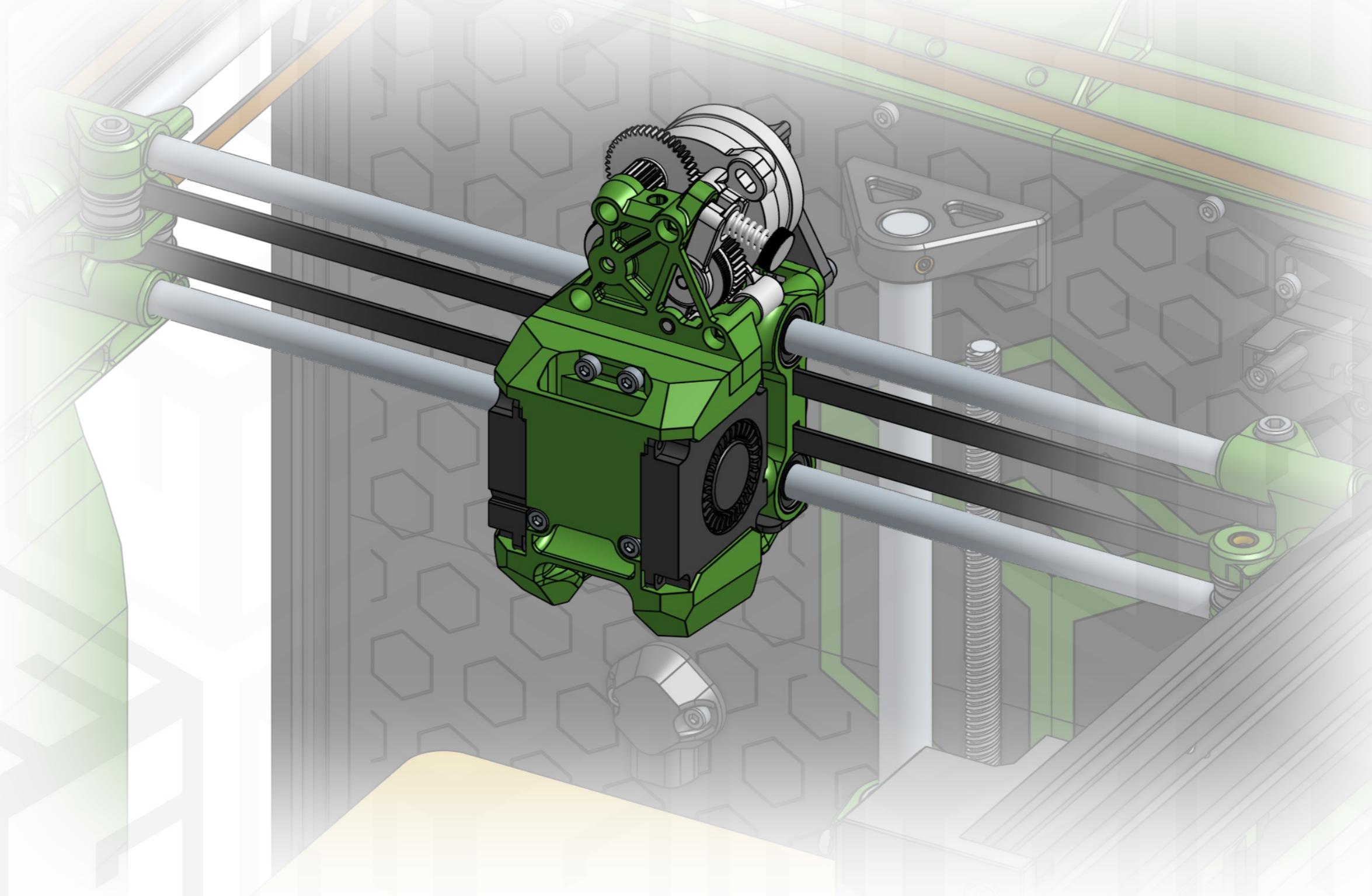
**WARNING: PROPER INSTALL**  
After installing belts, tighten them equally and test the motion, it should make no rubbing noises and should be smooth along the entire path.  
Both X and Y motion are engaging both stepper motors, so it is normal when the toolhead doesn't want to move only along X or Y axis.

**WARNING: BELT TENSION**  
For proper tension, pluck the rear part of the belt and measure the frequency.  
It should be 56 Hz.

The value has been recalculated for the rear part of the belt and the recommended tension follows the Voron belt tensioning recommendation.  
( 110 Hz accross 150 mm )



# TOOLHEAD



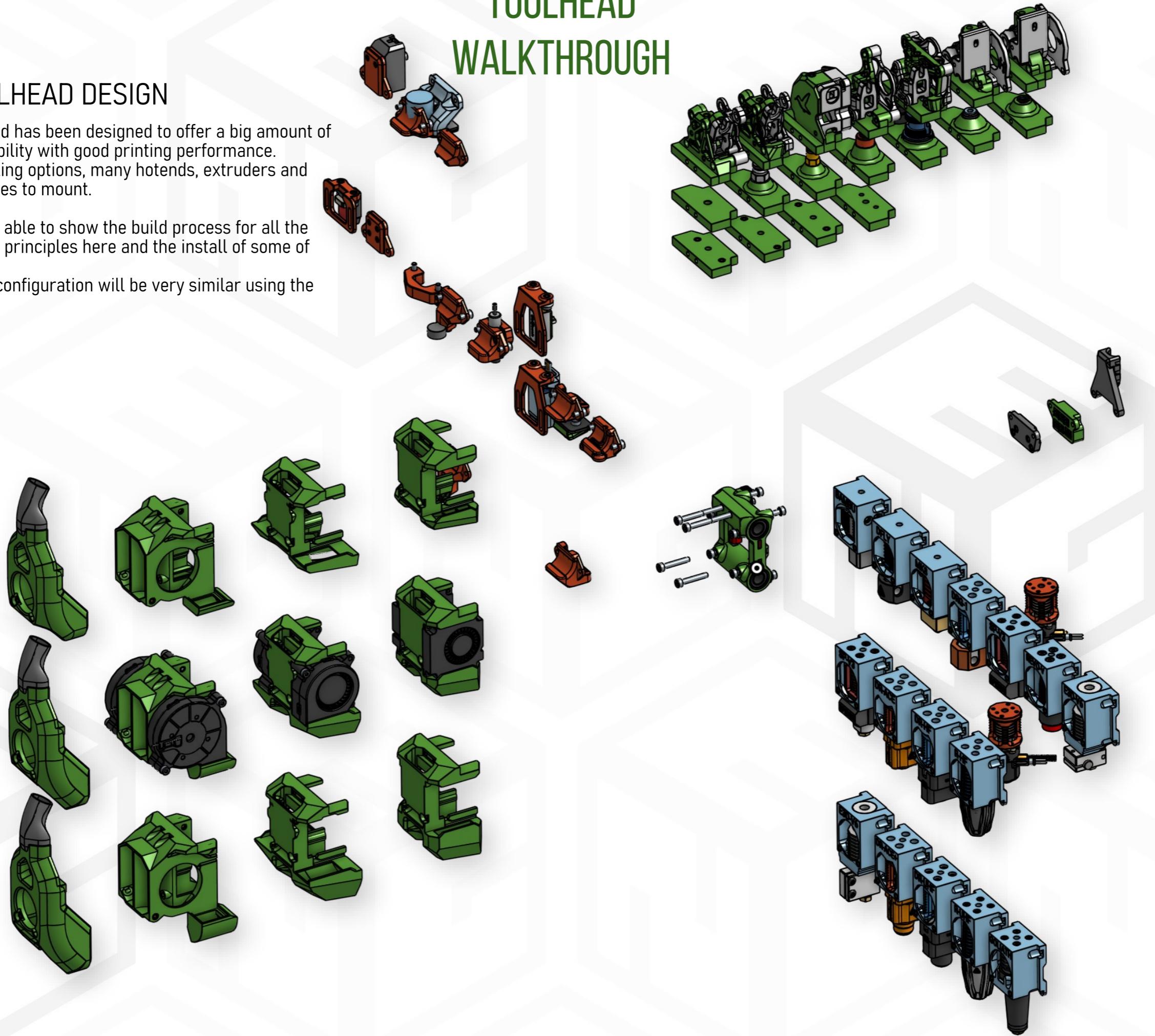
# TOOLHEAD WALKTHROUGH

## ABOUT THE TOOLHEAD DESIGN

The E3NG universal toolhead has been designed to offer a big amount of customisation and compatibility with good printing performance. You can choose from 4 cooling options, many hotends, extruders and probes and some accessories to mount.

Because of that, we are not able to show the build process for all the options but you will see the principles here and the install of some of the components.

The build process for your configuration will be very similar using the same methods.



# TOOLHEAD HOTEND

## TOOLS:

Heat set insert press  
2 mm Allen key ( based on the hotend mounting )  
2.5 mm Allen key

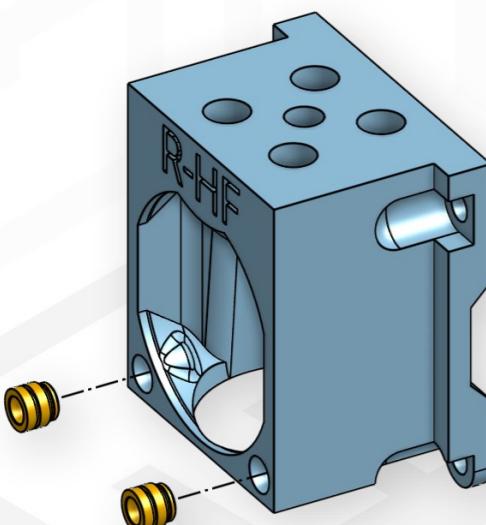
## HARDWARE:

- 2x M3 Heat insert
- 4x M3x6 SHCS
- 4x M2.5x8 SHCS ( or other based on your hotend mounting )
- 1x ZipTie

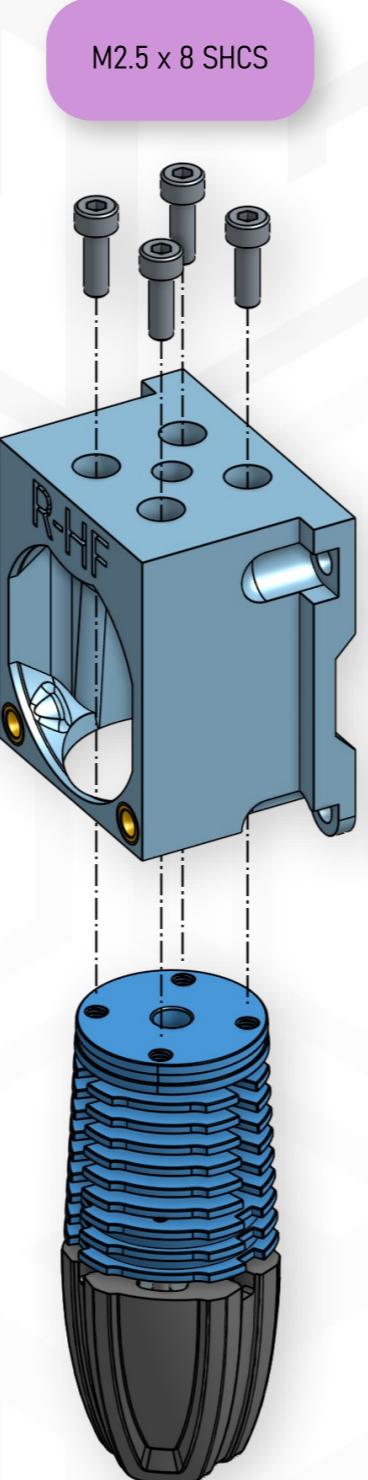
## PRINTED PARTS:

toolhead\_hotend\_XXXXX.stl

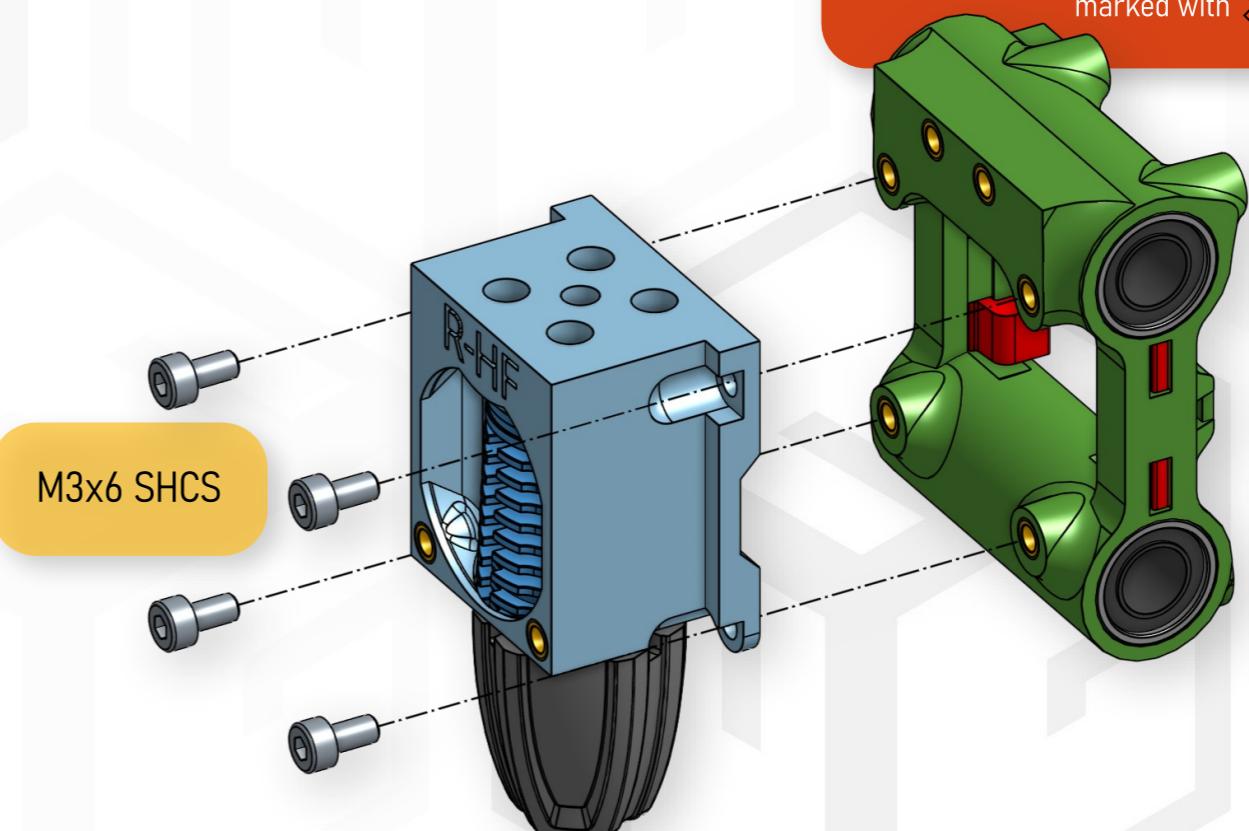
toolhead\_hotend\_XXXXX.stl



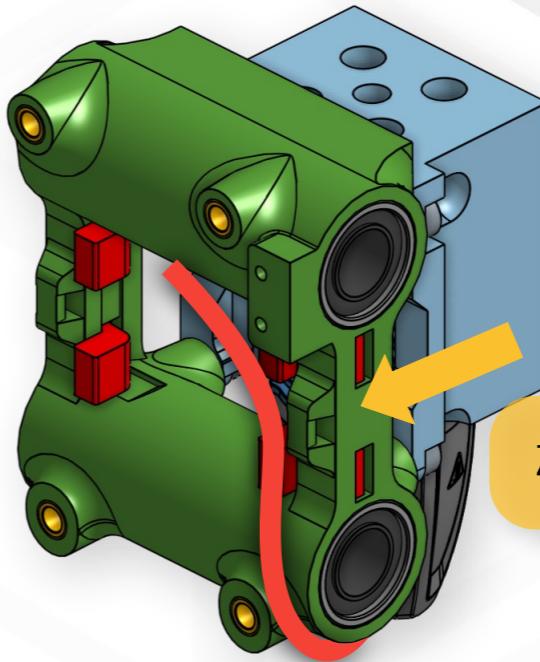
M3 Heat Set Inserts



M2.5 x 8 SHCS



M3x6 SHCS



**TIP: HOTEND WIRES**  
Run the hotend wires below the lower LM8LUU and secure them to the X carriage with a Ziptie. With some hotends, you can run the heater and thermistor wires through the X carriage.

## HOTEND VARIANTS

Based on your hotend selection, the mounting solution will be slightly different and you may need some other hardware.

## 4010 COOLING

# TOOLHEAD FANDUCT

### TOOLS:

2.5 mm Allen key

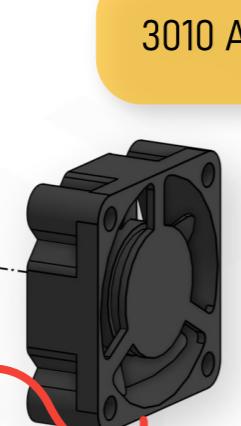
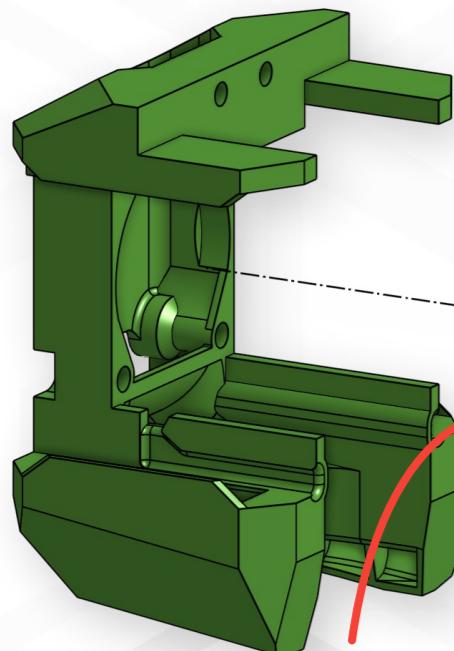
### HARDWARE:

2x M3x20 SHCS

3010 axial fan  
4010 radial fan

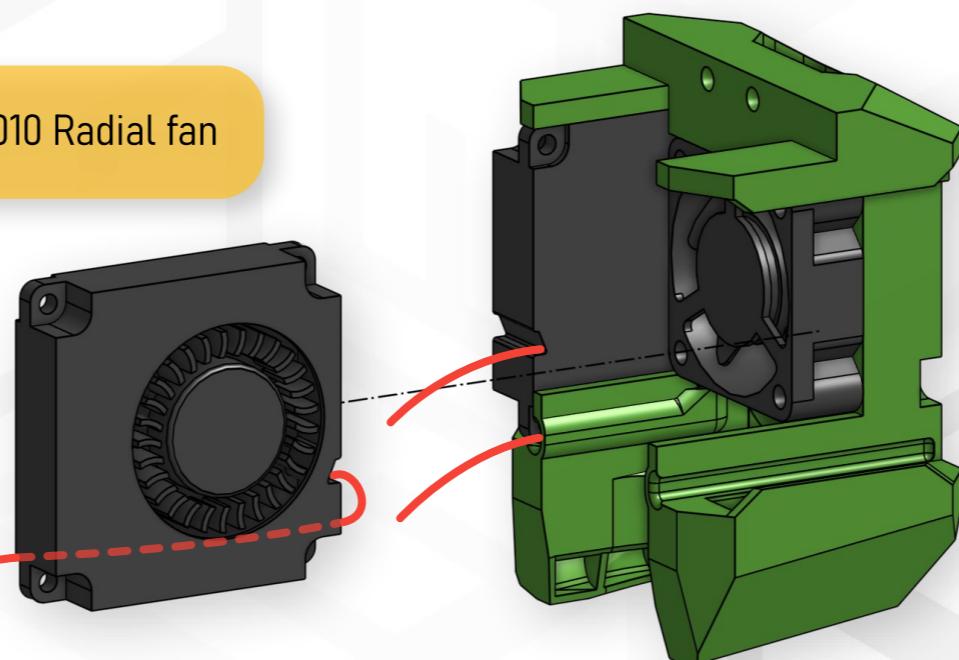
### PRINTED PARTS:

toolhead\_fanduct\_4010\_X.stl

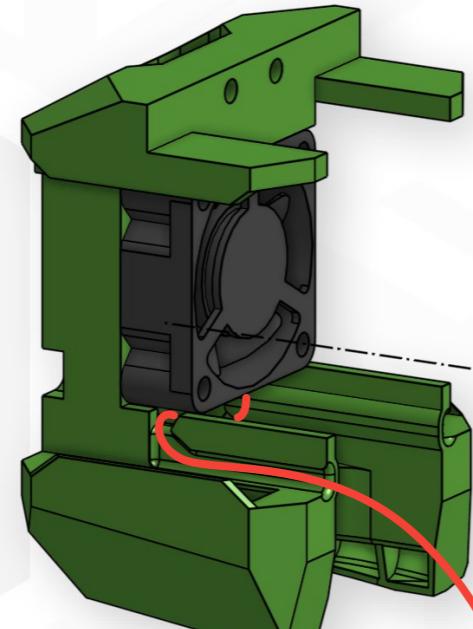


3010 Axial fan

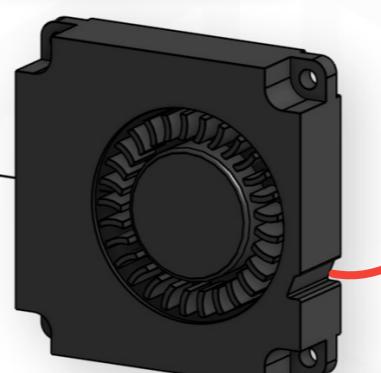
4010 Radial fan



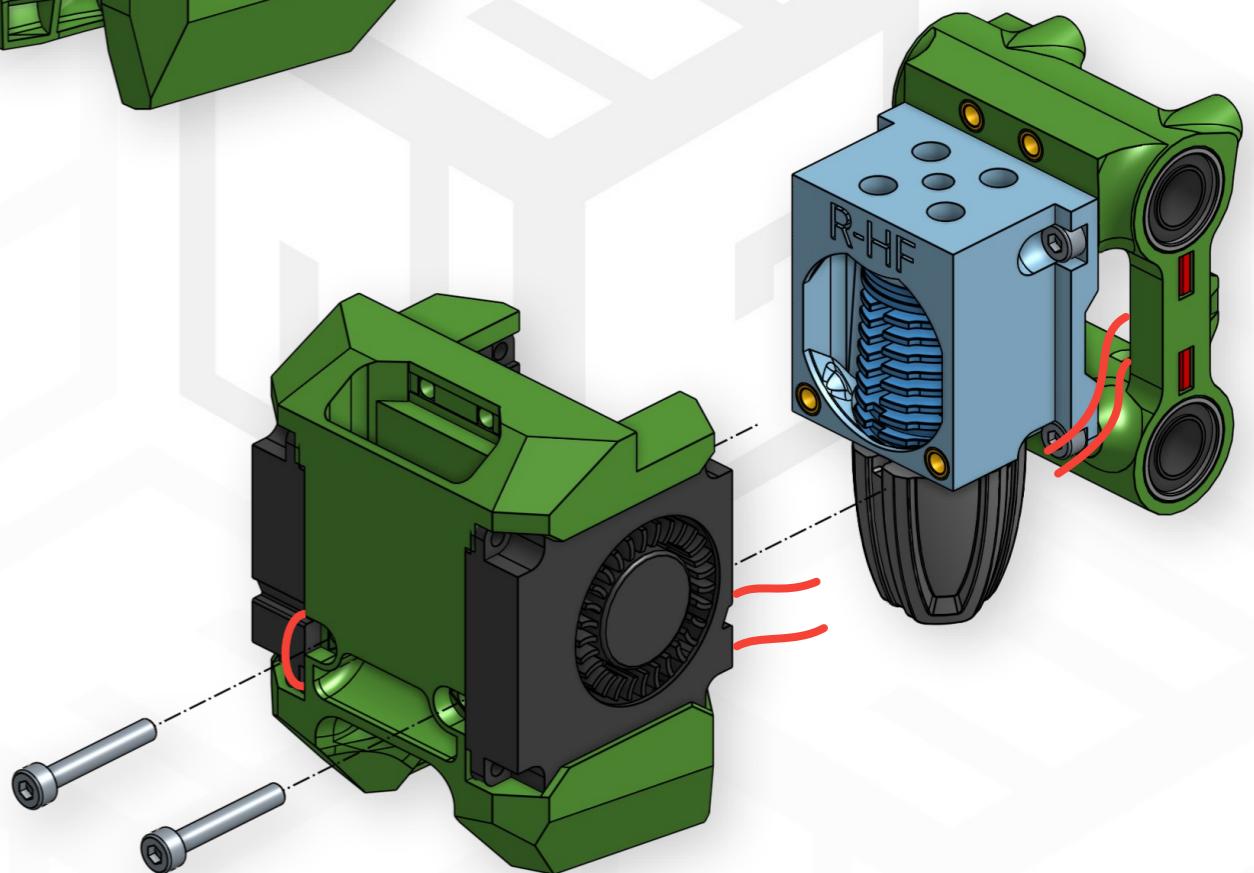
toolhead\_fanduct\_4010\_X.stl



4010 Radial fan



M3x20 SHCS



### TIP: HOTEND WIRING

On some hotends with the cylindrical heater cartridge, you will be required to bend the wires 90° just when coming out the cartridge to fit the fanduct.

Do it carefully and once done, don't bend them back again as repeated bending may break the wires.

### TIP: FAN WIRING

Follow the wiring scheme for each fan and run the wires through the designated channel. Then guide the wires between the hotend mount and the toolhead carriage.

## 4020 COOLING

# TOOLHEAD FANDUCT

### TOOLS:

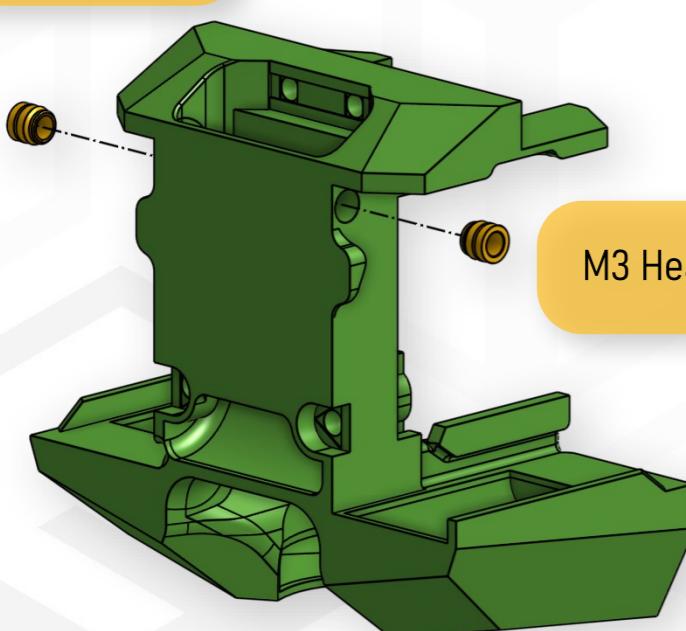
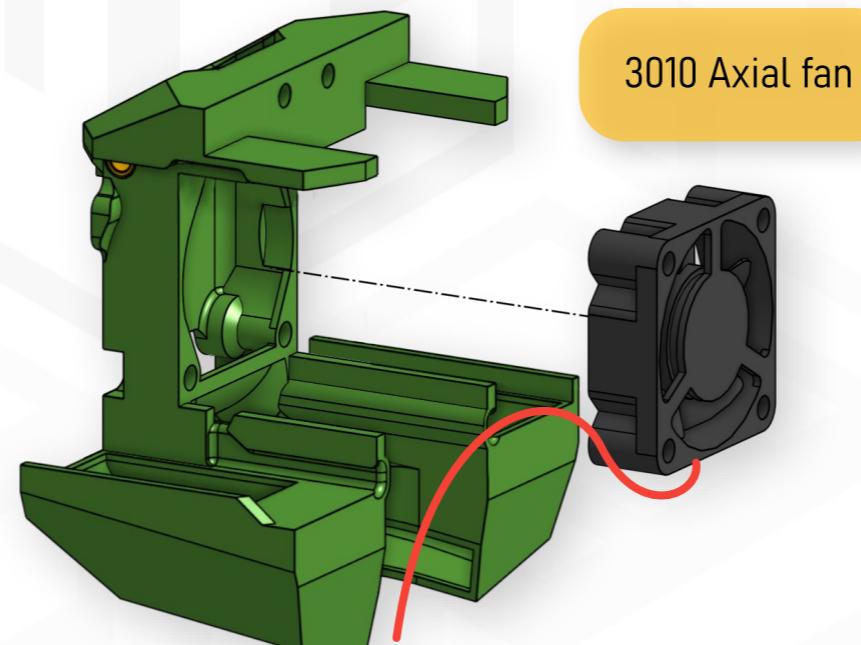
Heat set insert press  
2.5 mm Allen key

### HARDWARE:

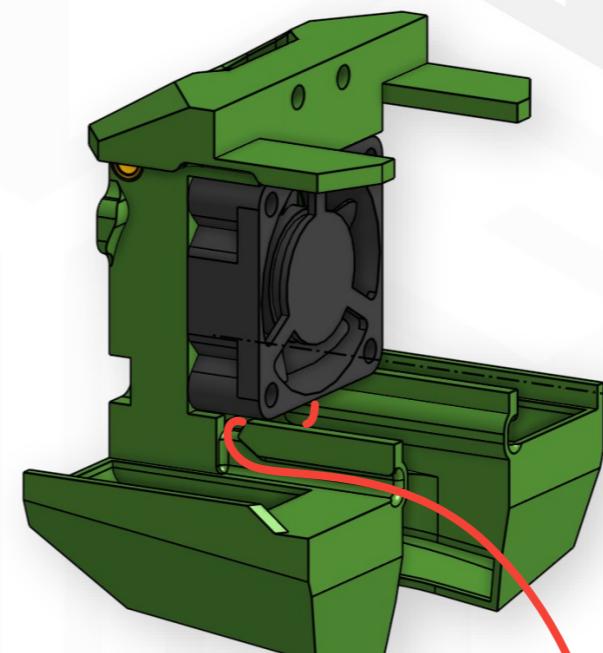
- 2x M3 Heat set insert
- 2x M3x16 SHCS
- 2x M3x20 SHCS
- 2x 3010 axial fan
- 2x 4020 radial fan

### PRINTED PARTS:

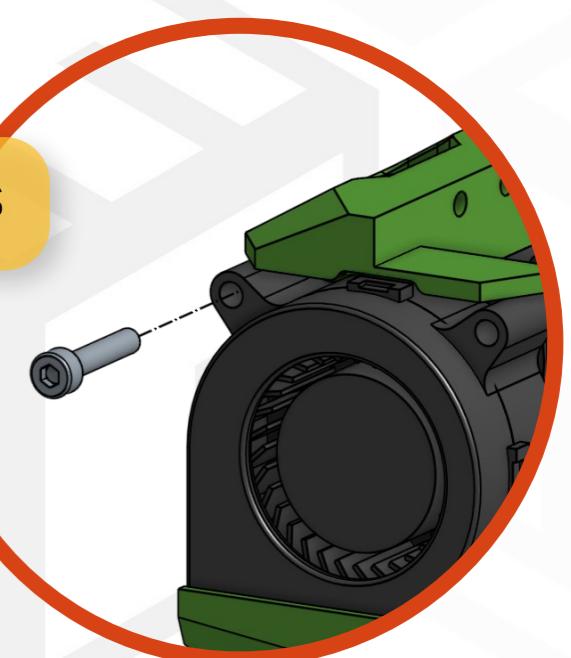
toolhead\_fanduct\_4010\_X.stl



toolhead\_fanduct\_4020\_X.stl



M3x16 SHCS

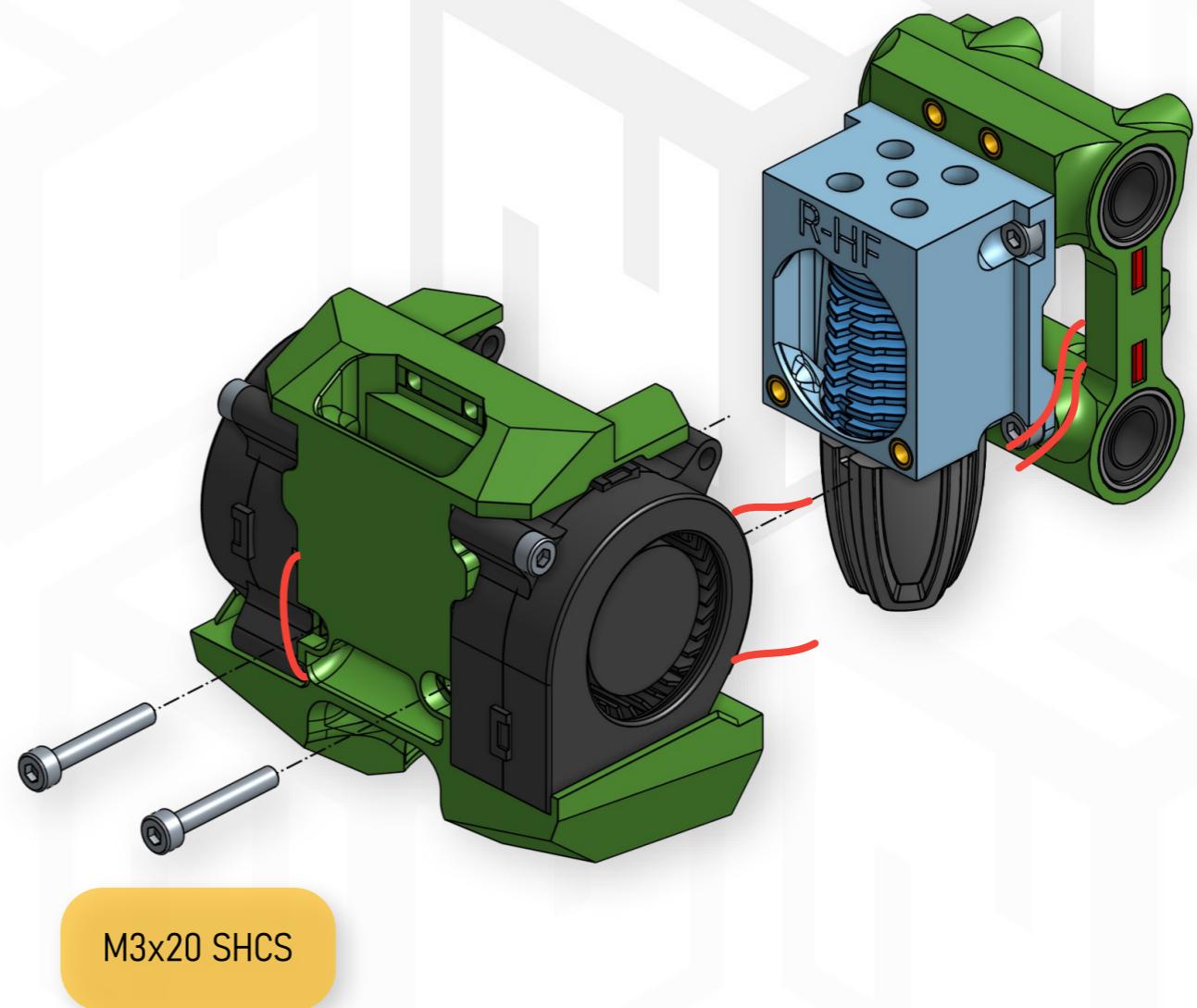
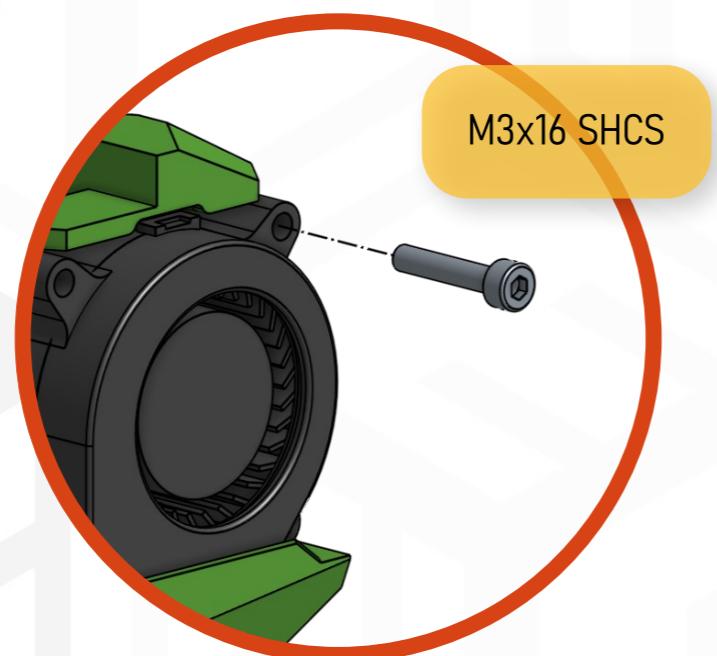
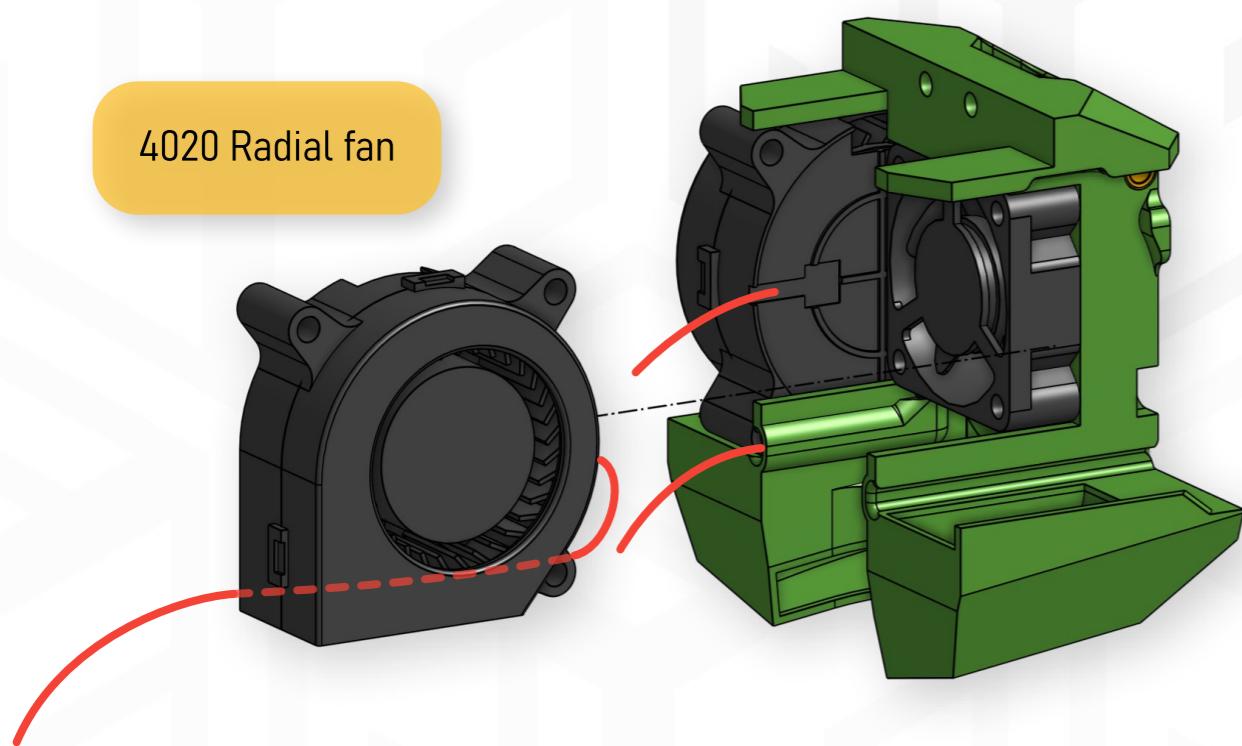


4020 Radial fan

**TIP: FAN WIRING**  
Follow the wiring scheme for each fan and run the wires through the designated channel. Then guide the wires between the hotend mount and the toolhead carriage.

## 4020 COOLING

# TOOLHEAD FANDUCT



## TIP: HOTEND WIRING

On some hotends with the cylindrical heater cartridge, you will be required to bend the wires 90° just when coming out the cartridge to fit the fanduct.

Do it carefully and once done, don't bend them back again as repeated bending may break the wires.

## TIP: FAN WIRING

Follow the wiring scheme for each fan and run the wires through the designated channel. Then guide the wires between the hotend mount and the toolhead carriage.

## 5015 COOLING

# TOOLHEAD FANDUCT

### TOOLS:

Heat set insert press  
2.5 mm Allen key

### HARDWARE:

4x M3 Heat set insert  
6x M3x20 SHCS  
2x 3010 axial fan  
5015 radial fan

### PRINTED PARTS:

toolhead\_fanduct\_5015\_X.stl

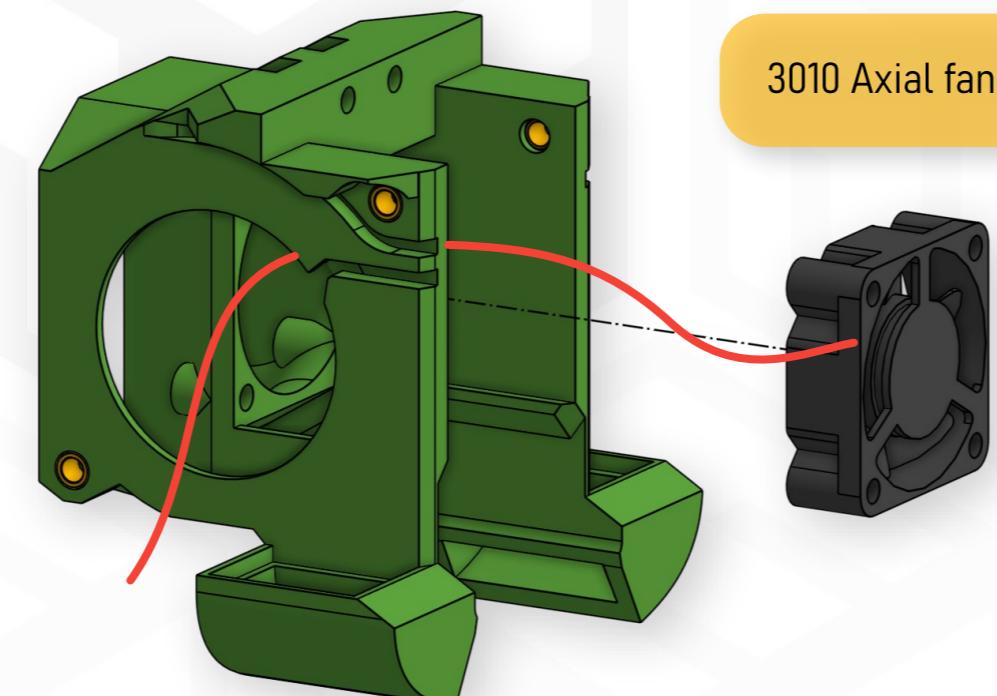
M3 Heat Set Insert

M3 Heat Set Insert

M3 Heat Set Insert

toolhead\_fanduct\_5015\_X.stl

M3 Heat Set Insert



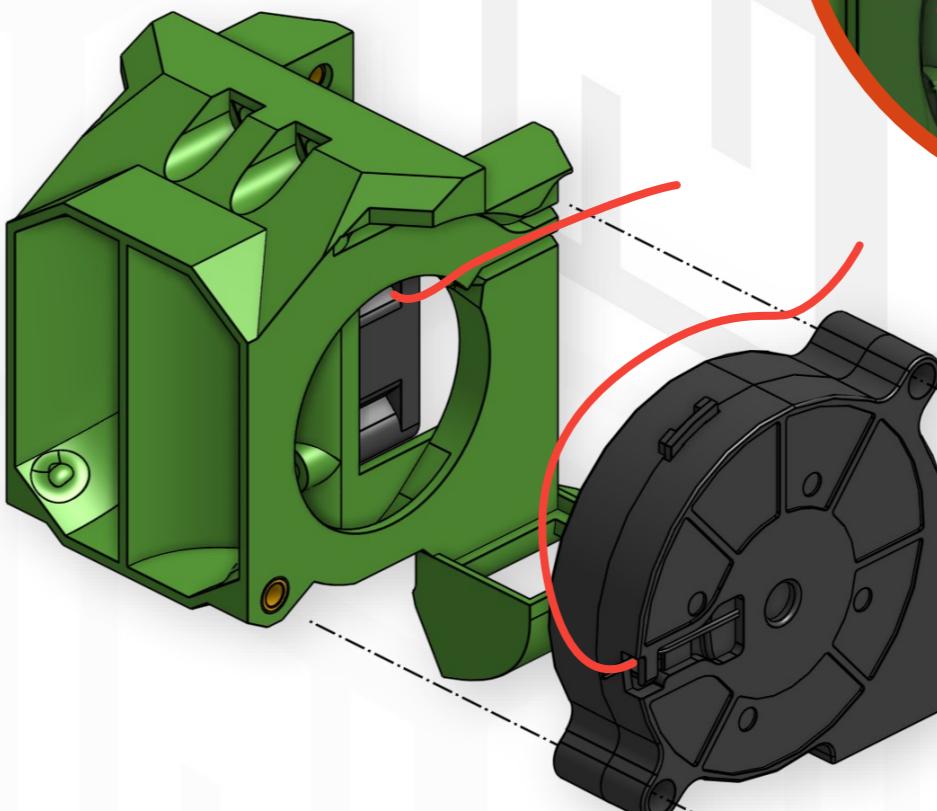
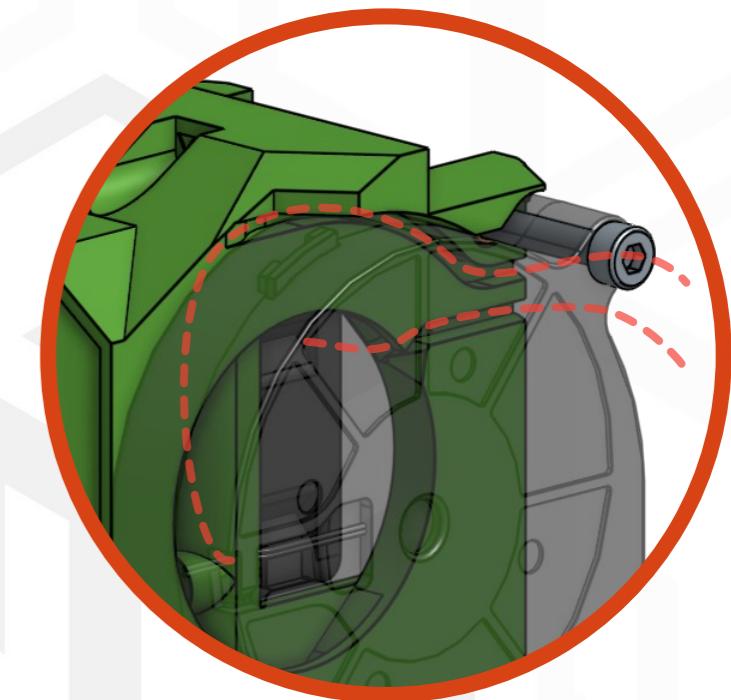
3010 Axial fan

### TIP: FAN WIRING

Follow the wiring scheme for each fan and run the wires through the designated channel. Then guide the wires between the hotend mount and the toolhead carriage.

### WARNING: REMOVE SUPPORT

Break off the built-in 2 supports marked with .

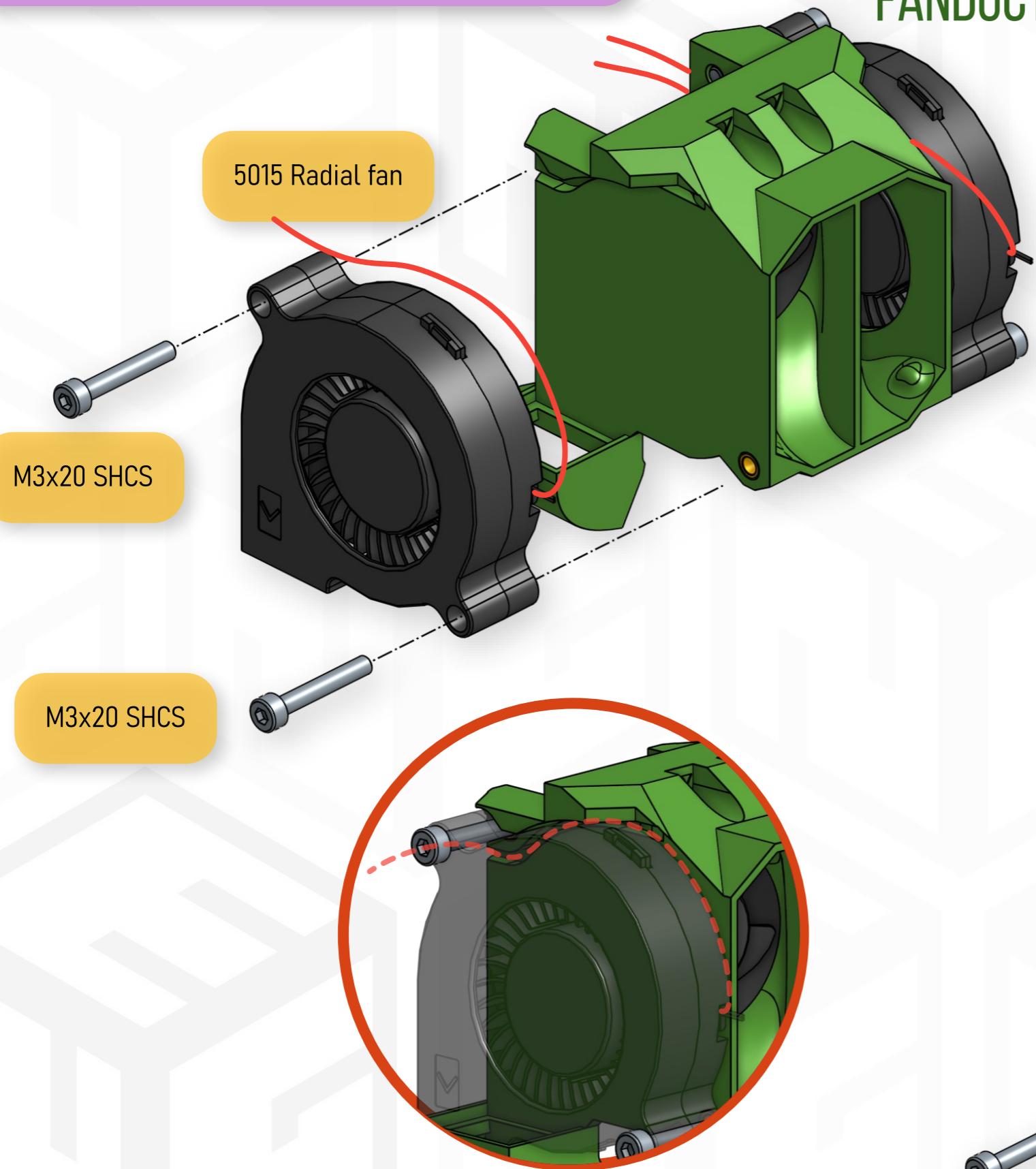


5015 Radial fan

M3x20 SHCS

5015 COOLING

## TOOLHEAD FANDUCT



M3x20 SHCS

RH3D.XYZ

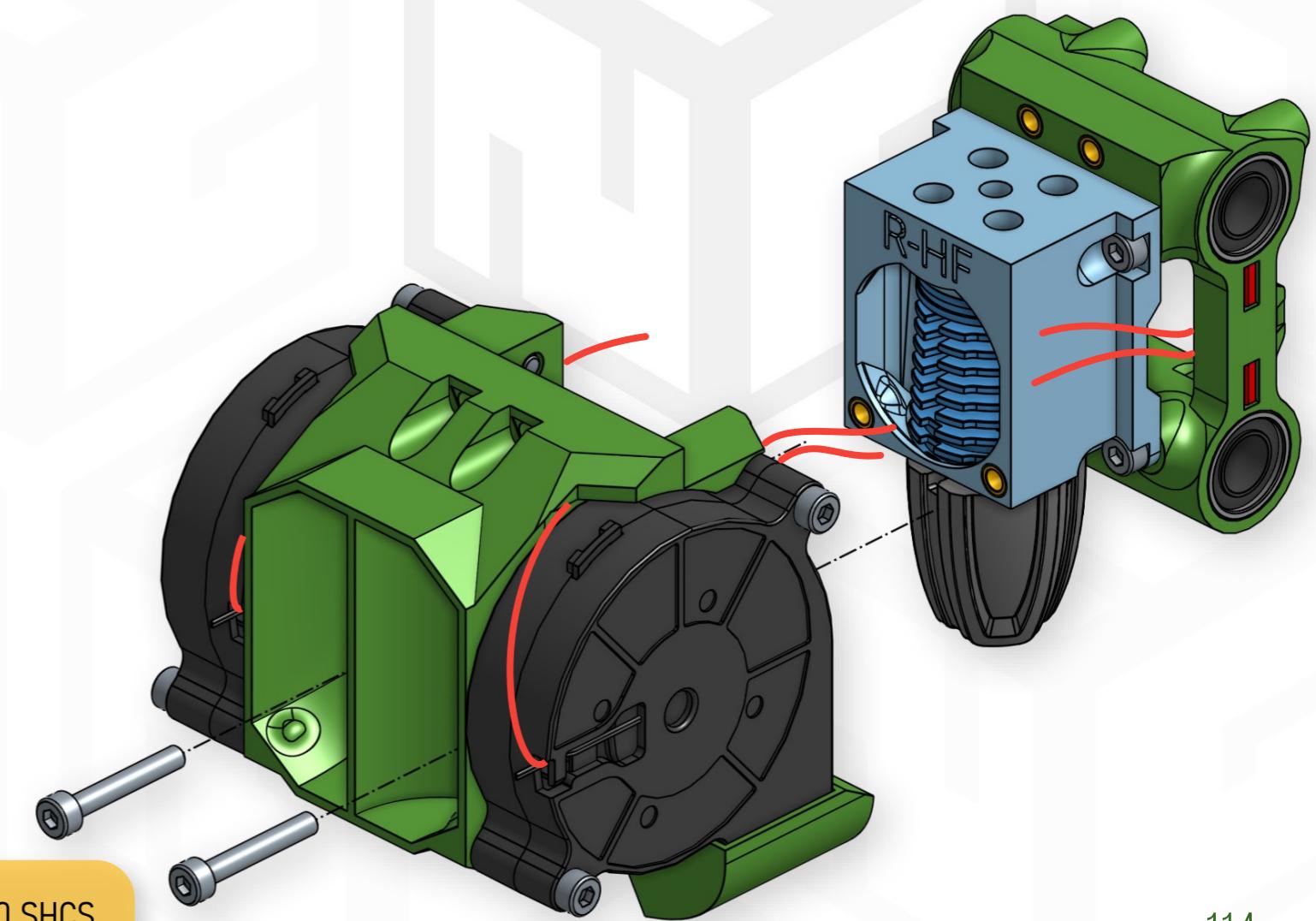
### TIP: HOTEND WIRING

On some hotends with the cylindrical heater cartridge, you will be required to bend the wires 90° just when coming out the cartridge to fit the fanduct.

Do it carefully and once done, don't bend them back again as repeated bending may break the wires.

### TIP: FAN WIRING

Follow the wiring scheme for each fan and run the wires through the designated channel. Then guide the wires between the hotend mount and the toolhead carriage.



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## CPAP COOLING

# TOOLHEAD FANDUCT

### TOOLS:

Glue fo plastics  
2.5 mm Allen key

### HARDWARE:

2x M3x16 SHCS  
3010 axial fan

### PRINTED PARTS:

toolhead\_fanduct\_CPAP\_X.stl  
toolhead\_fanduct\_CPAP\_adapter.stl

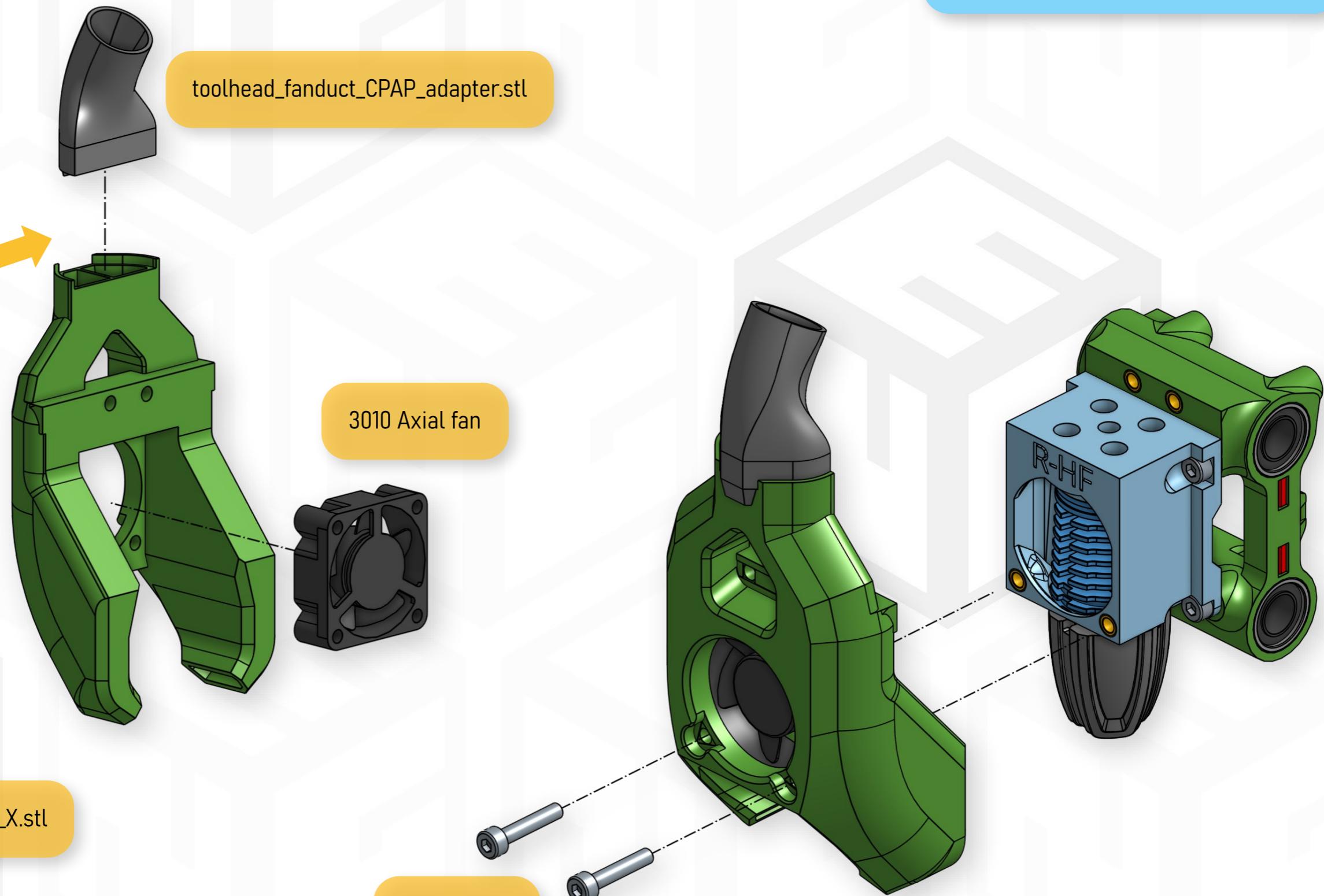
M3x16 SHCS

toolhead\_fanduct\_CPAP\_X.stl

Glue joint

3010 Axial fan

toolhead\_fanduct\_CPAP\_adapter.stl



### TIP: HOTEND WIRING

On some hotends with the cylindrical heater cartridge, you will be required to bend the wires 90° just when coming out the cartridge to fit the fanduct.

Do it carefully and once done, don't bend them back again as repeated bending may break the wires.

## TOOLS:

Heat set insert press ( depending on your setup )  
Razor knife / PTFE tube cutter  
2.5 mm Allen key

## HARDWARE:

2x M3x35 SHCS

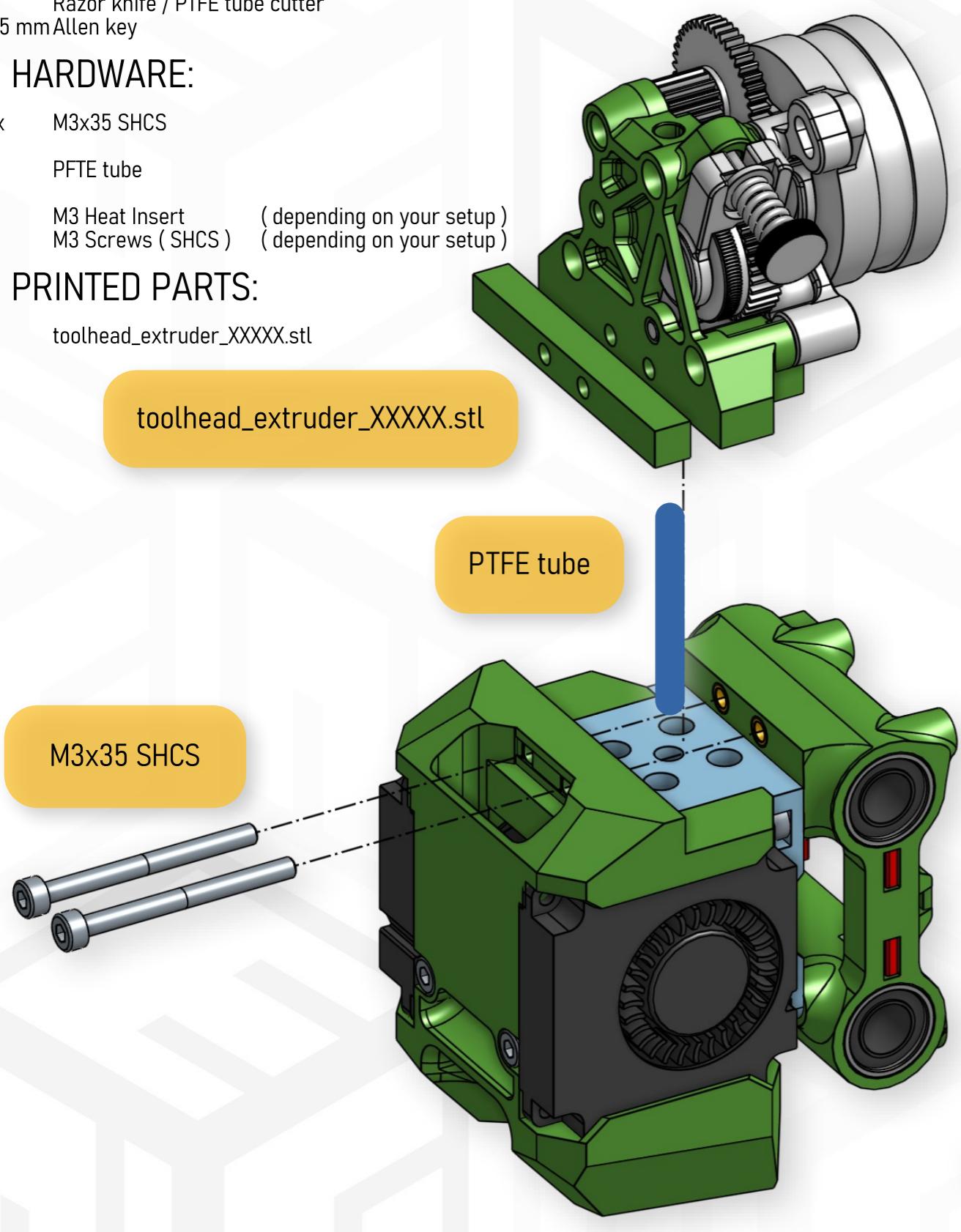
PTFE tube

M3 Heat Insert ( depending on your setup )  
M3 Screws ( SHCS ) ( depending on your setup )

## PRINTED PARTS:

toolhead\_extruder\_XXXXX.stl

# TOOLHEAD EXTRUDER



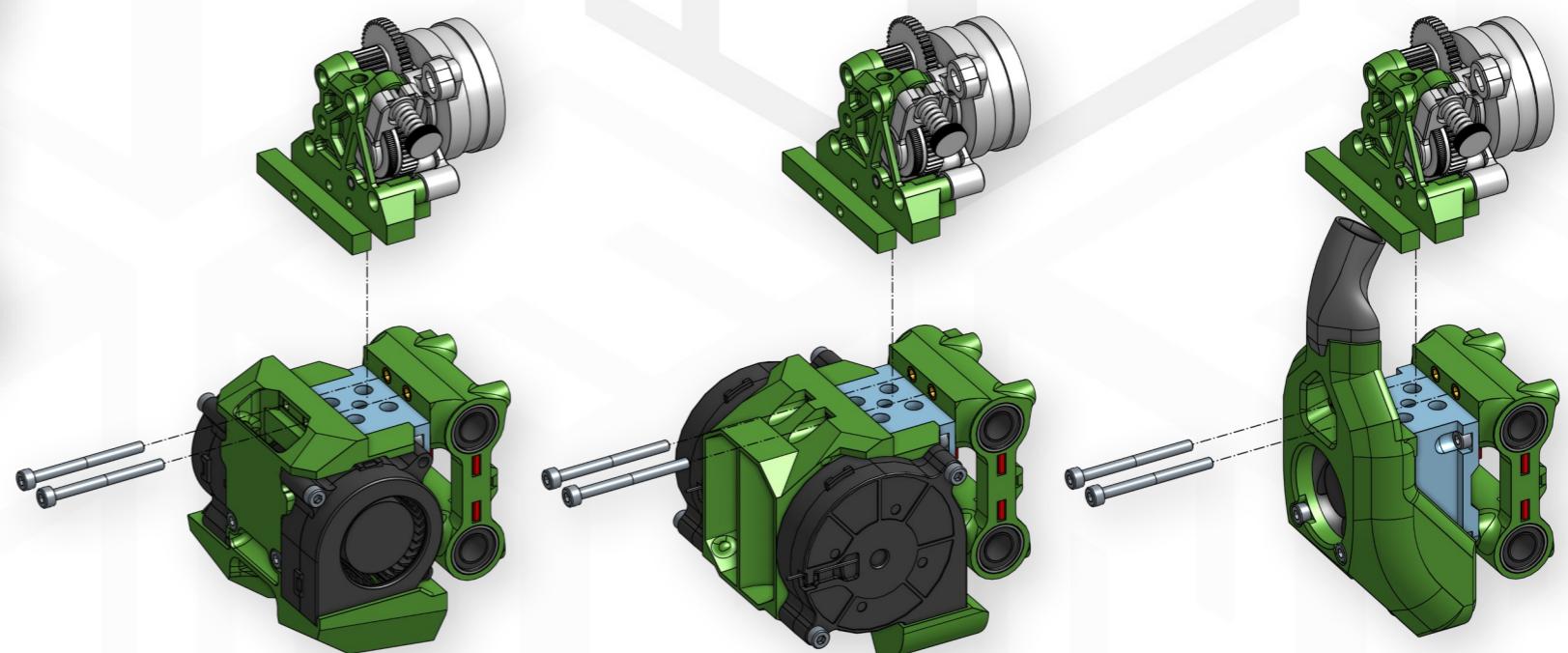
**TIP: PTFE TUBE LENGTH**  
To measure the required PTFE tube length, first insert it into the hotend part, mark the end position and measure the length. Do the same with the extruder.  
The final length is the sum of both + 0.5 mm.

## EXTRUDER VARIANTS

Depending on your extruder choice, you will need the appropriate mounting hardware. Most other extruder mounts use two M3 heat set inserts and M3x10 SHCS.

## INTEGRATED EXTRUDER

To assemble the integrated extruder, follow the official documentation for the chosen extruder, use the official files to print and only replace the part from the E3NG project.



## TOOLS:

Heat set insert press ( depending on your setup )  
2 mm Allen key ( depending on your setup )  
2.5 mm Allen key

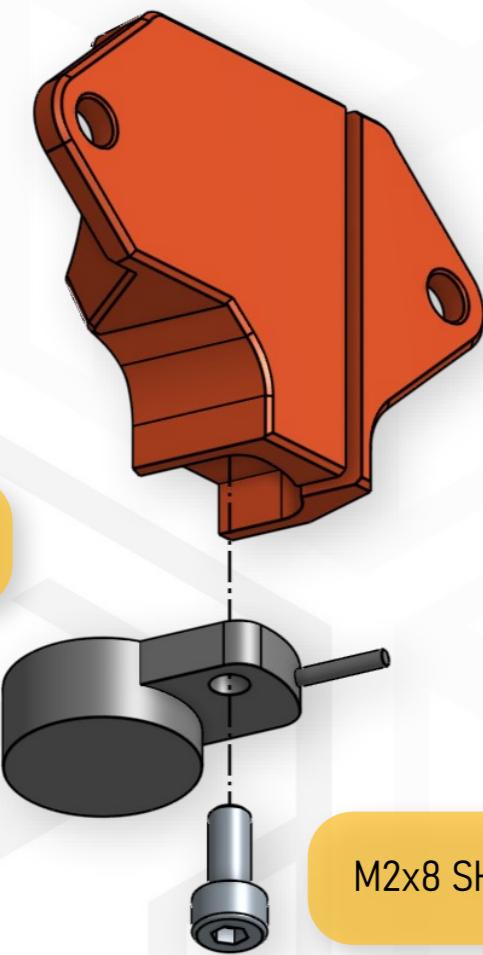
## HARDWARE:

2x M3x6 SHCS

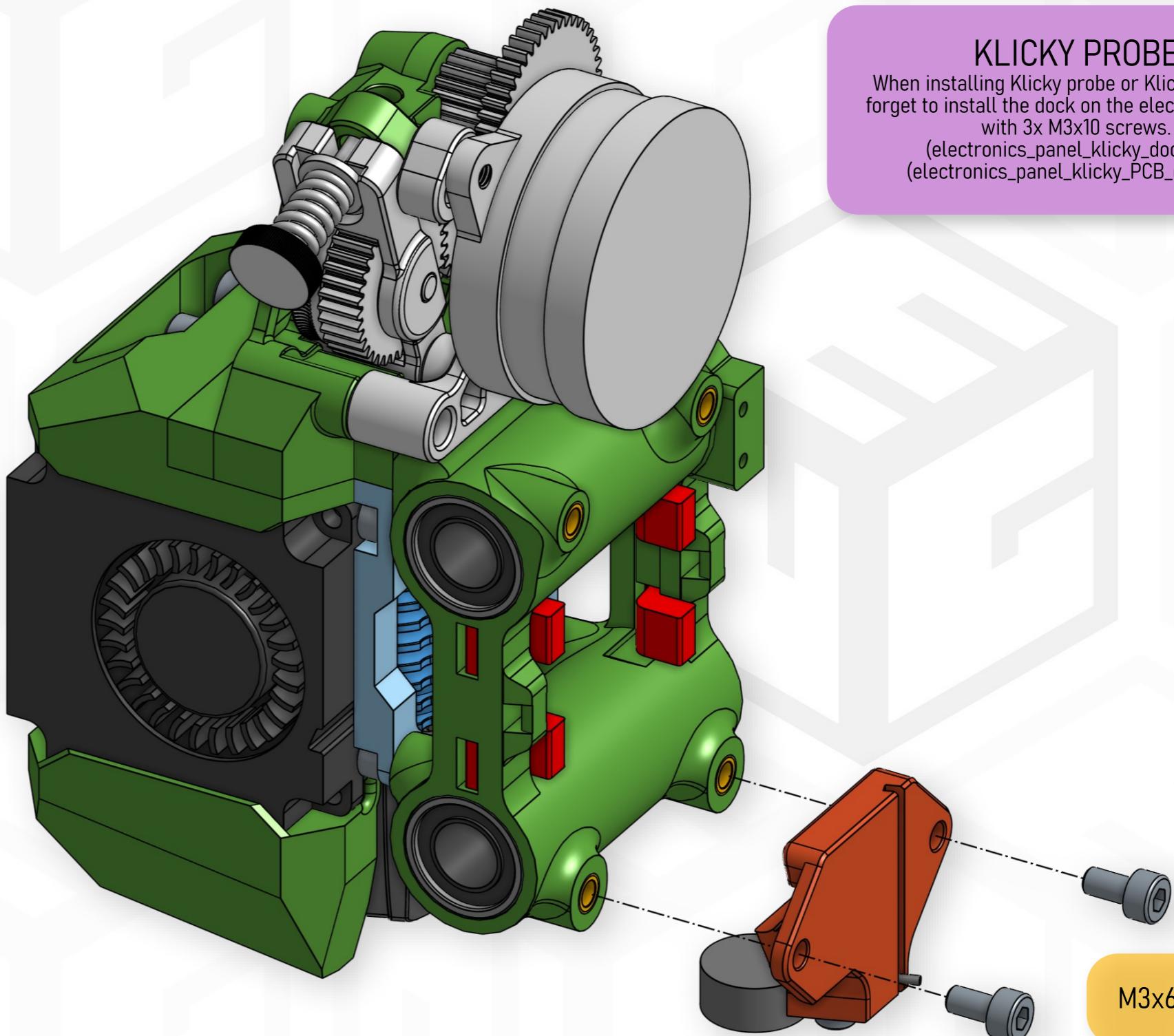
Heat Inserts ( depending on your setup )  
Screws ( depending on your setup )

## PRINTED PARTS:

toolhead\_probe\_XXXXX.stl



# TOOLHEAD BED PROBE



## PROBE VARIANTS

Depending on your probe choice, you will need the appropriate mounting hardware.  
Print the adequate parts and follow the install assembly according to the probe documentation.

## KLICKY PROBE

When installing Klacky probe or KlackyPCB, don't forget to install the dock on the electronics panel with 3x M3x10 screws.  
(electronics\_panel\_klacky\_dock.stl),  
(electronics\_panel\_klacky\_PCB\_dock.stl)

# TOOLHEAD ACCESSORIES

## TOOLS:

Heat set insert press ( depending on your setup )  
Superglue ( depending on your setup )  
2.5 mm Allen key

## HARDWARE:

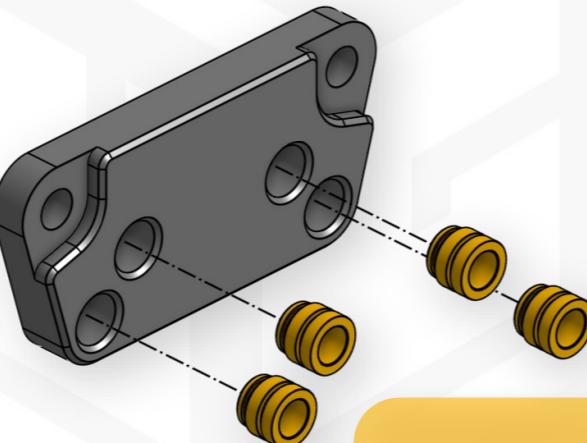
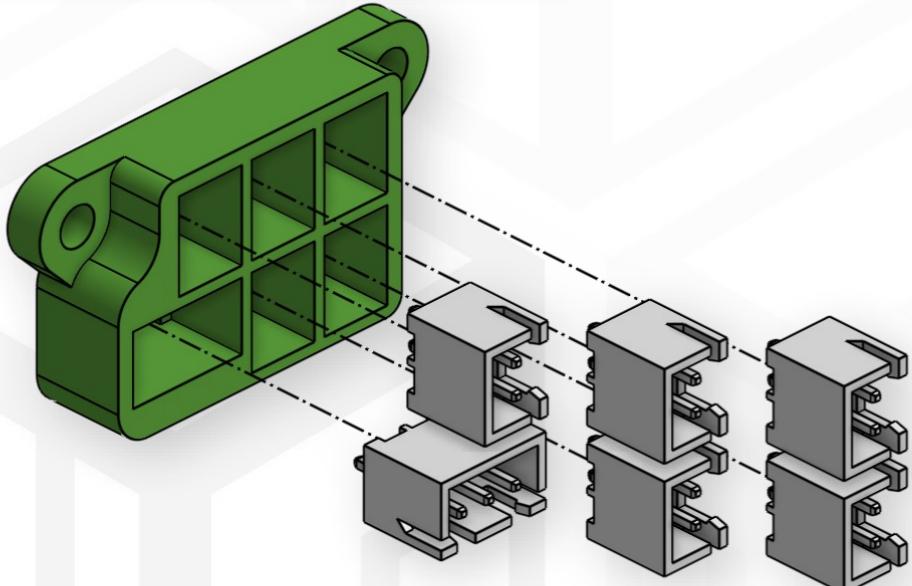
2x M3x10 SHCS  
Heat Inserts ( depending on your setup )  
Zipties ( depending on your setup )  
5x JST XH 2pin ( depending on your setup )  
1x JST XH 3pin ( depending on your setup )

## PRINTED PARTS:

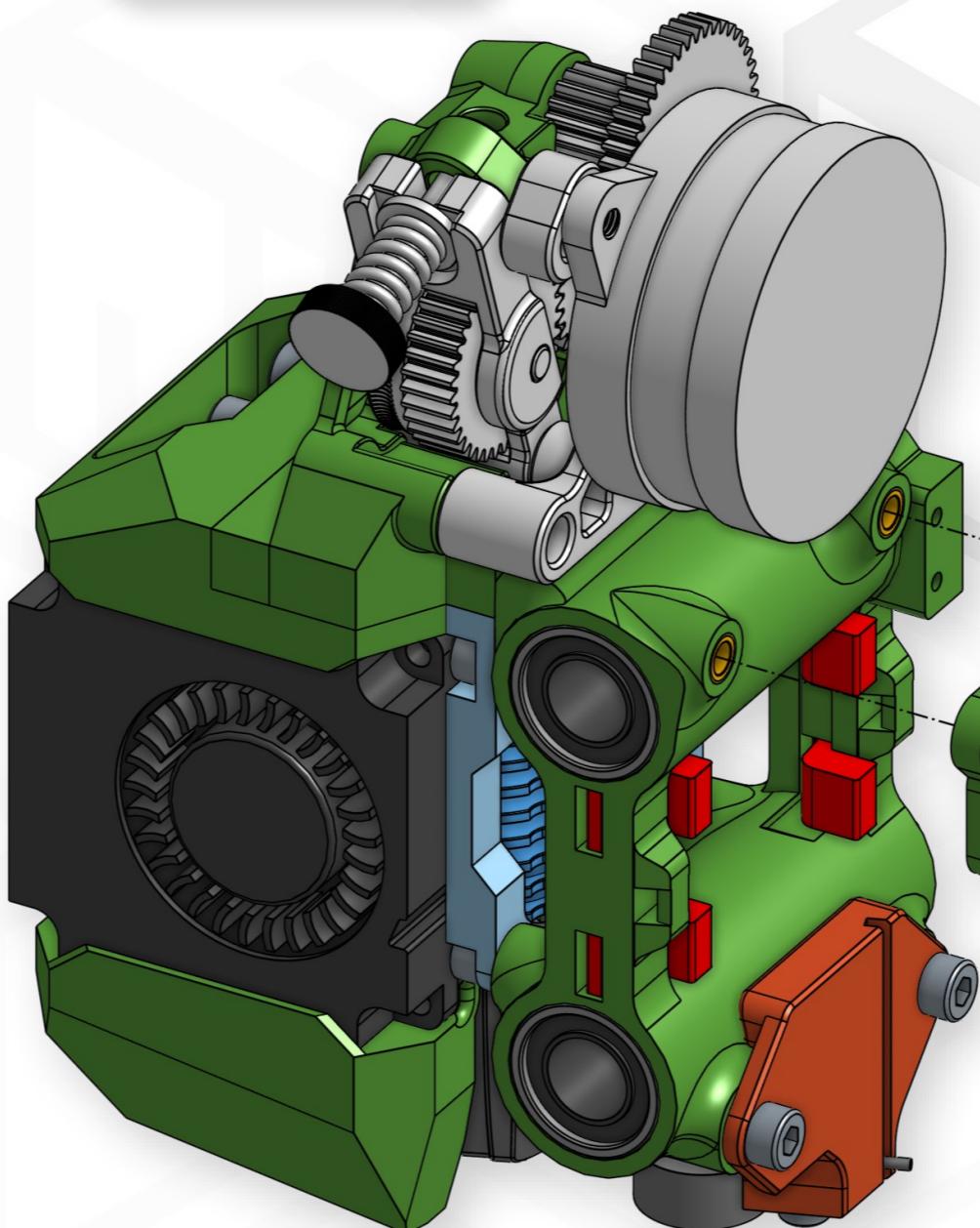
toolhead\_accessories\_XXXXX.stl

toolhead\_accessories\_accelerometer.stl

toolhead\_accessories\_breakout.stl



M3 Heat Set Inserts



**ACCELEROMETER MOUNT**  
The accelerometer mount supports both KUSBA and ADXL 345 mounting pattern.

## CABLE HOLDER

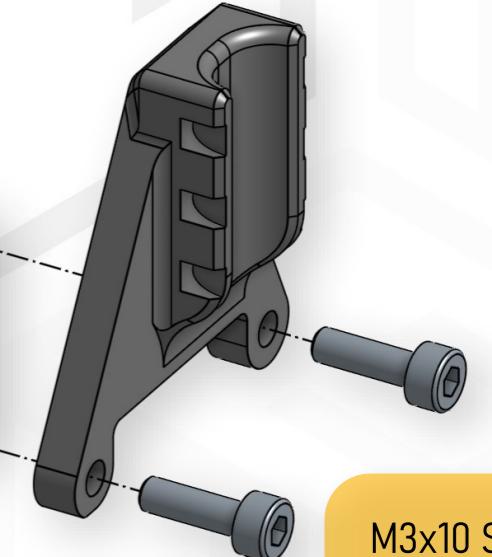
For easier cable management, Use zipties to secure the wire loom.

## CABLE BREAKOUT

Glue the JST XH connectors in place and solder the wire loom from the other side. Helps with toolhead maintenance.

2x Part cooling fan (2 pin)  
1x Hotend cooling fan (2 pin)  
1x X endstop (2 pin)  
1x Thermistor (2 pin)  
1x BED probe (3 pin)

toolhead\_accessories\_cable.stl



M3x10 SHCS

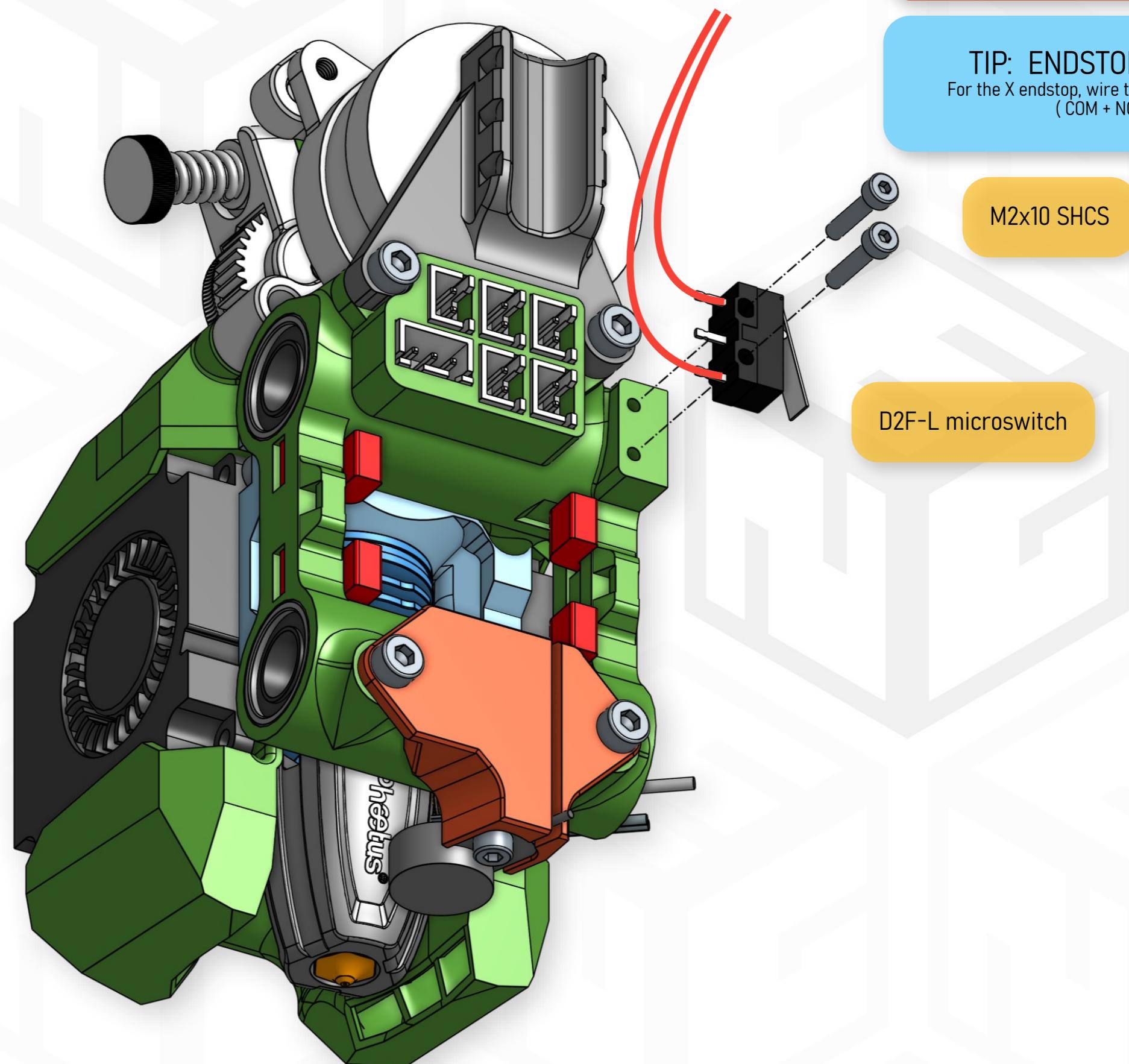
## TOOLS:

1.5 mm Allen key

## HARDWARE:

2x M2x10 SHCS  
D2F-L Microswitch

# TOOLHEAD X ENDSTOP



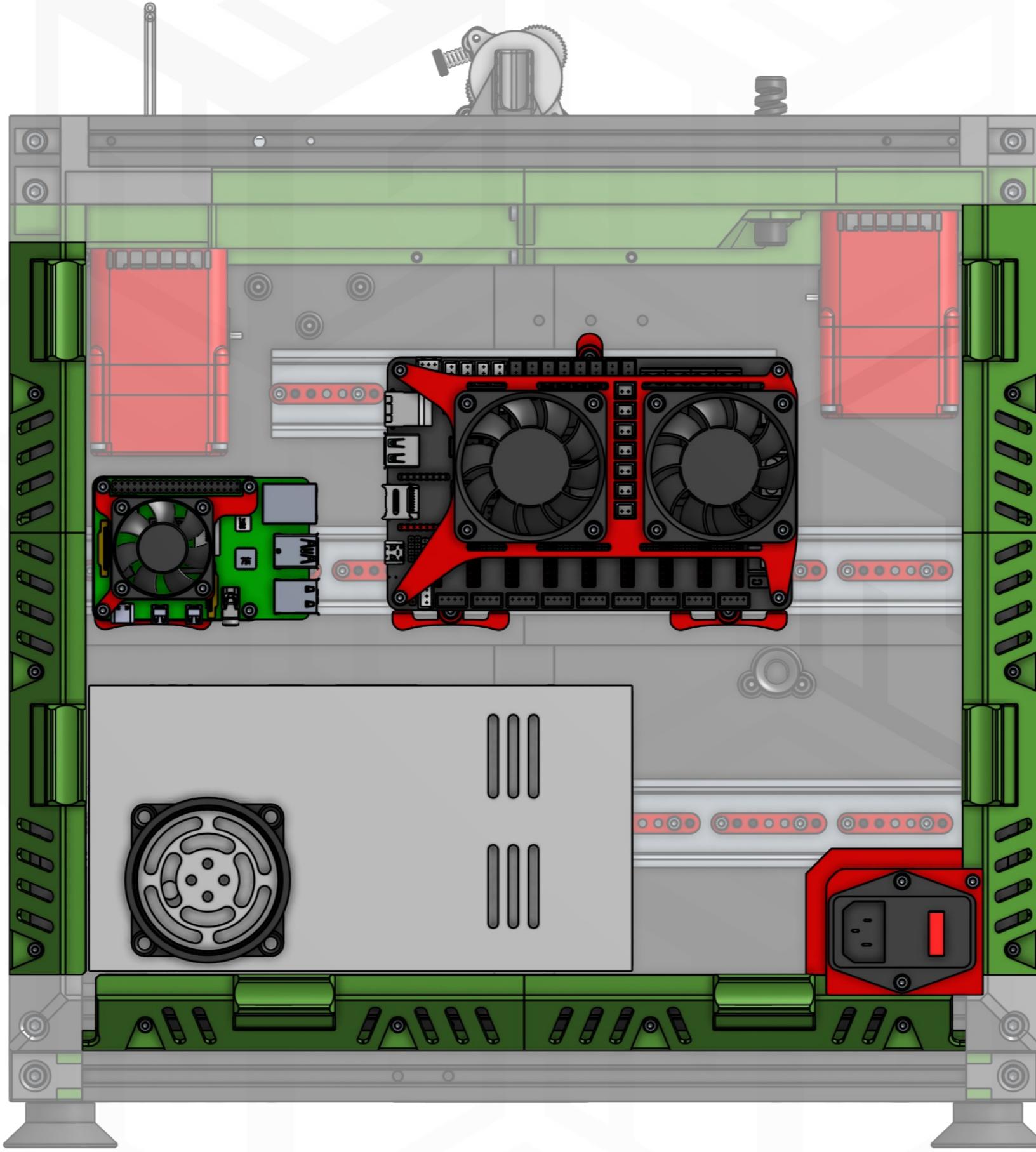
**WARNING: CAREFUL**  
Be careful when tightening the M2 screws  
as they screw directly into the plastic.

**TIP: ENDSTOP WIRES**  
For the X endstop, wire the two side pins.  
( COM + NC )

M2x10 SHCS

D2F-L microswitch

# ELECTRONICS



TOOLS:

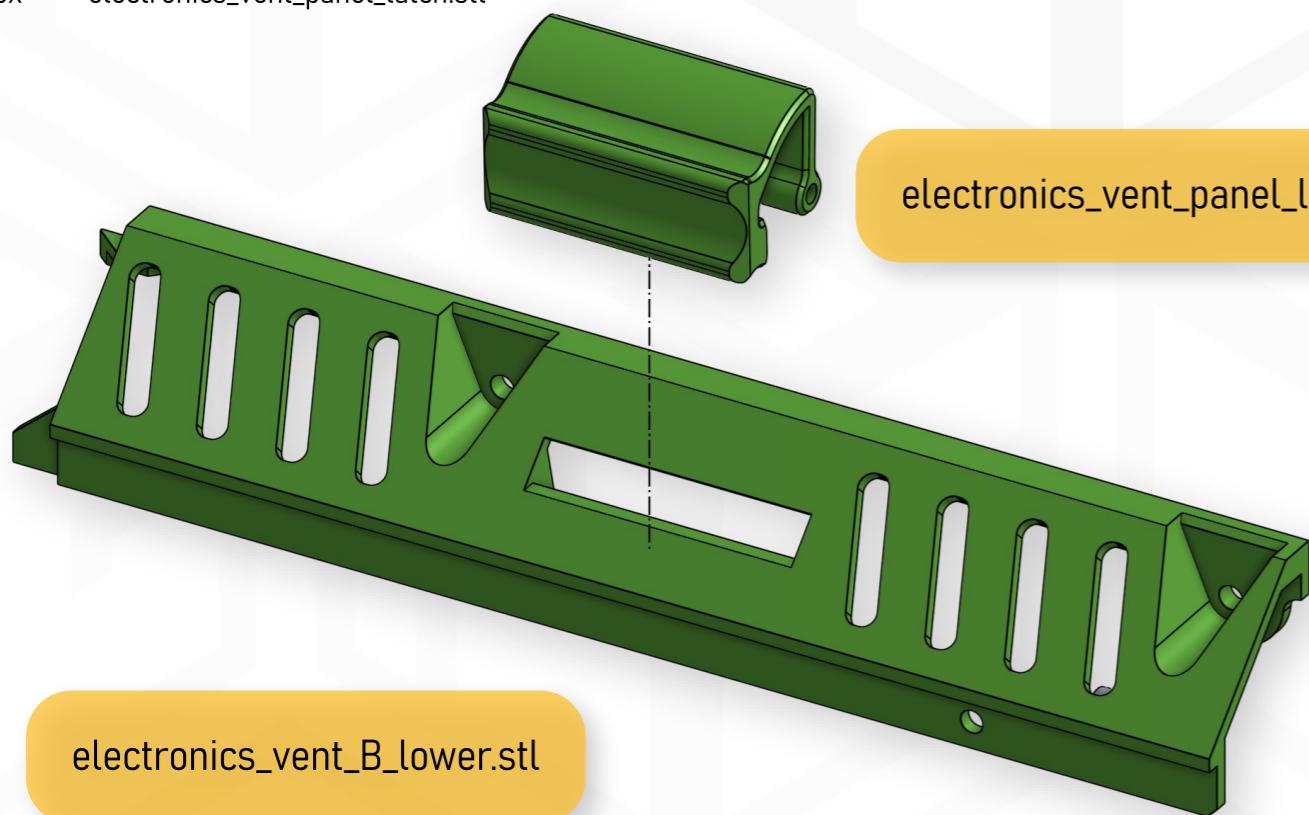
2.5 mm Allen key

HARDWARE:

12x M3x10 SHCS

PRINTED PARTS:

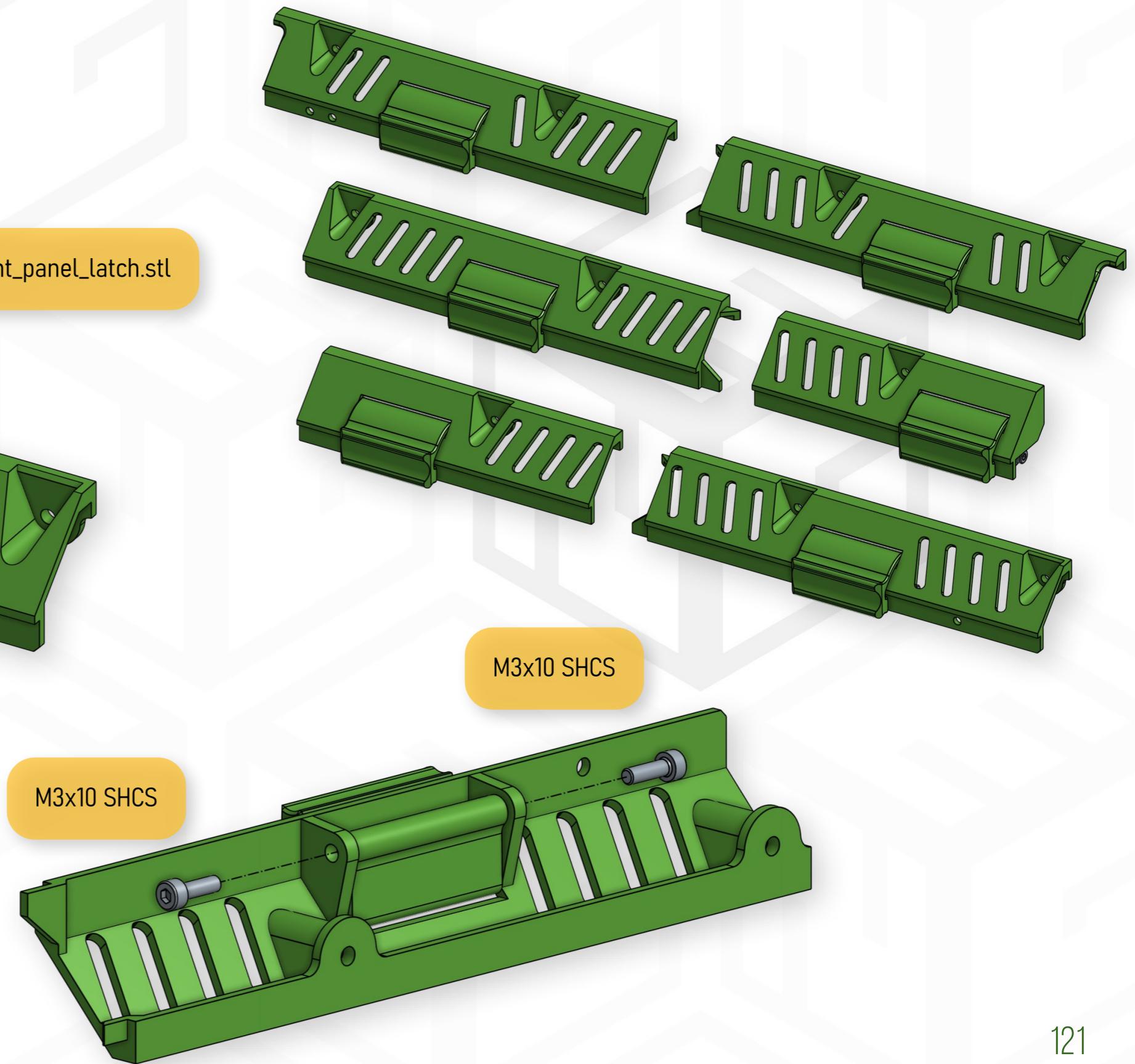
electronics\_vent\_A\_lower.stl  
electronics\_vent\_A\_upper.stl  
electronics\_vent\_B\_lower.stl  
electronics\_vent\_B\_upper.stl  
electronics\_vent\_bottom\_left.stl  
electronics\_vent\_bottom\_right.stl  
electronics\_vent\_panel\_latch.stl



# ELECTRONICS AIR VENT

## LATCH INSTALL

NOTE: REPEAT  
Repeat the latch install on all six parts.



## TOOLS:

Glue for plastics (CA glue is fine)  
2.5 mm Allen key

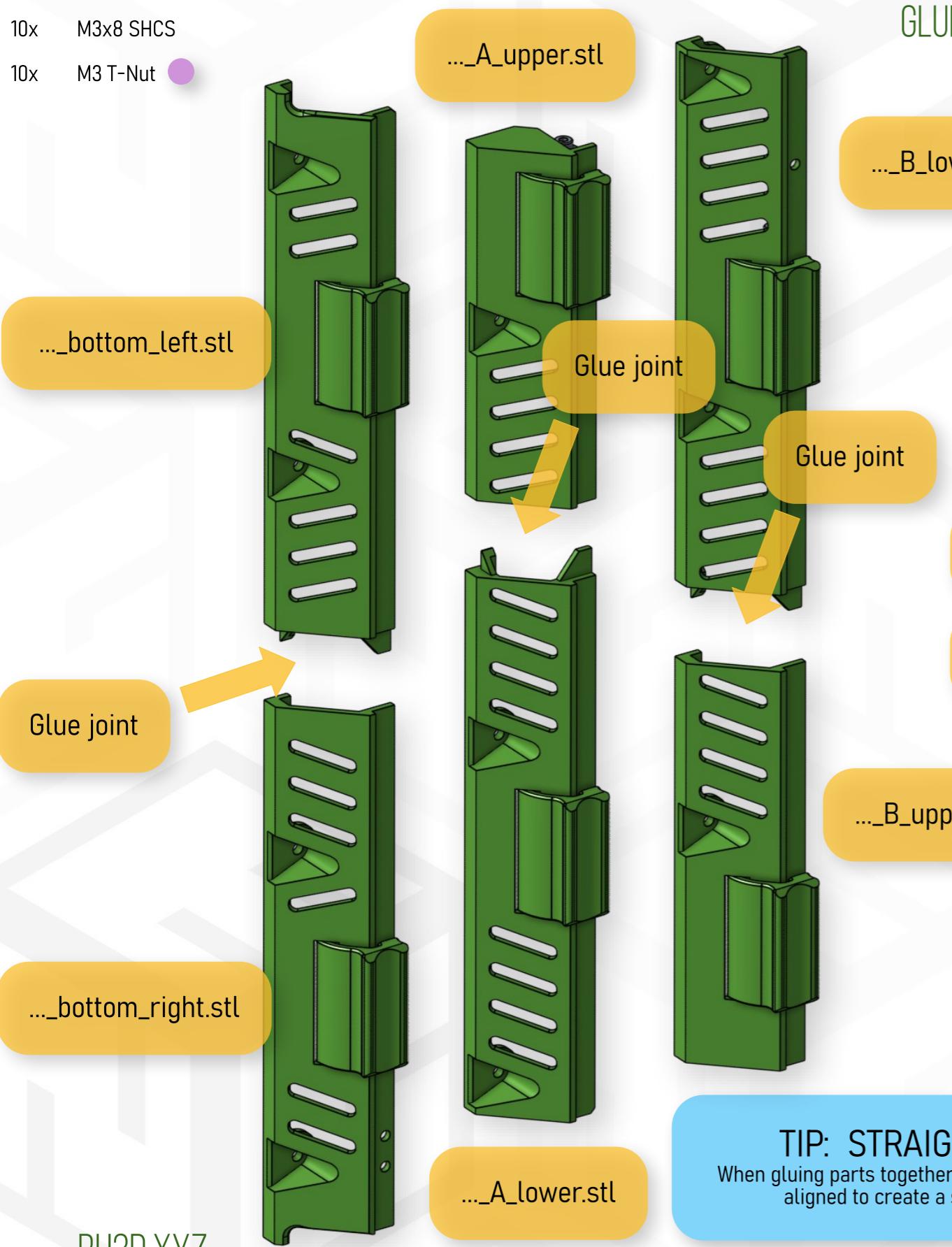
## HARDWARE:

10x M3x8 SHCS

10x M3 T-Nut

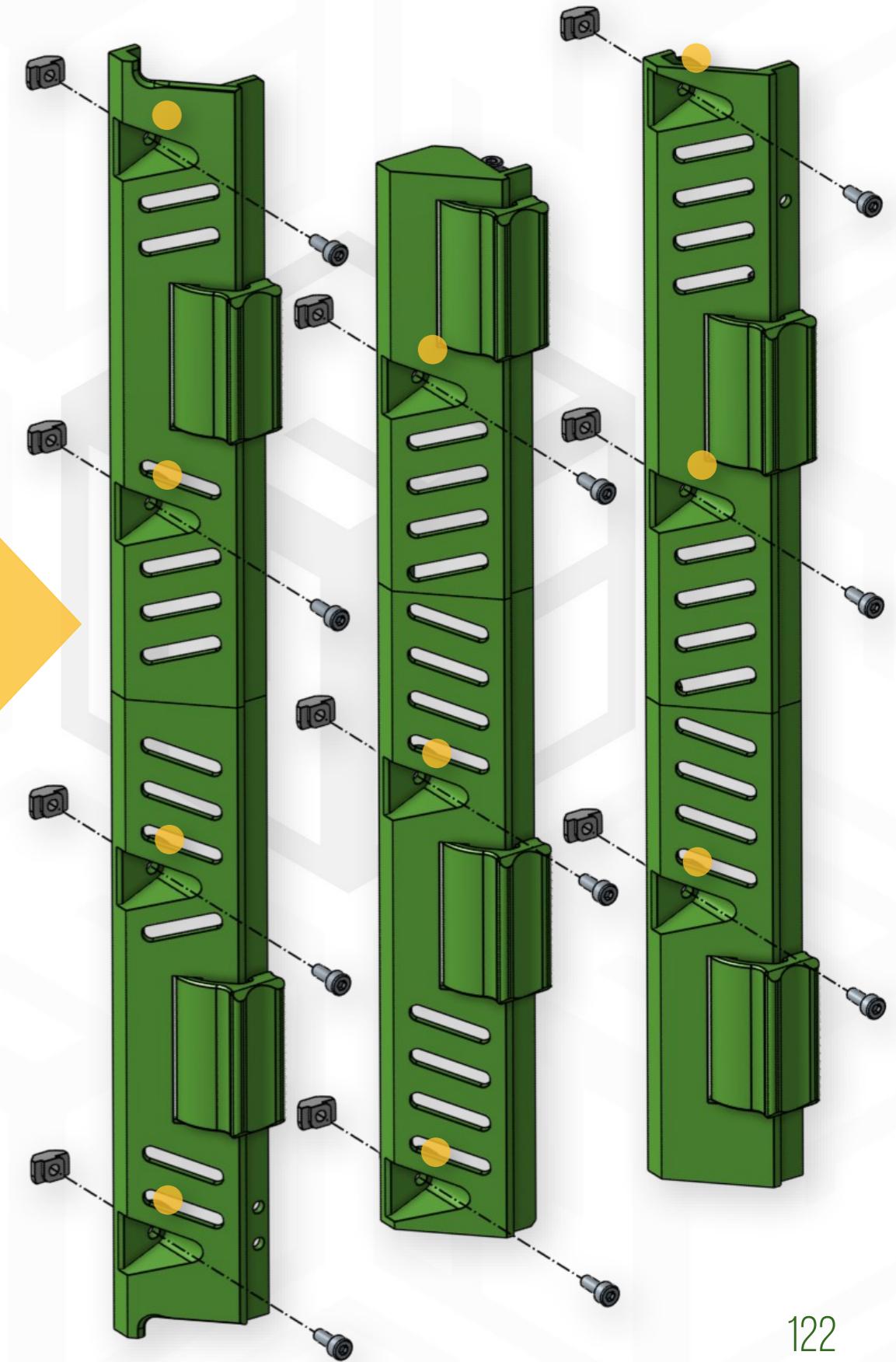
# ELECTRONICS AIR VENTS

## GLUEUP AND FASTENERS



### TIP: STRAIGHTNESS

When gluing parts together, make sure they are aligned to create a straight part.



## PRINTED FRAME

For the frame version with printed verticals, skip the six M3 T-Nuts on the side profiles ( A and B ) and only prepare the M3x8 SHCS there.

# ELECTRONICS FINAL PARTS

## TOOLS:

Heat set insert press  
1.5 mm Allen key  
2.5 mm Allen key  
3 mm Allen key

## HARDWARE:

4x M3 Heat set inserts

2x M2x10 SHCS  
1x M3x6 SHCS  
1x M4x8 SHCS1

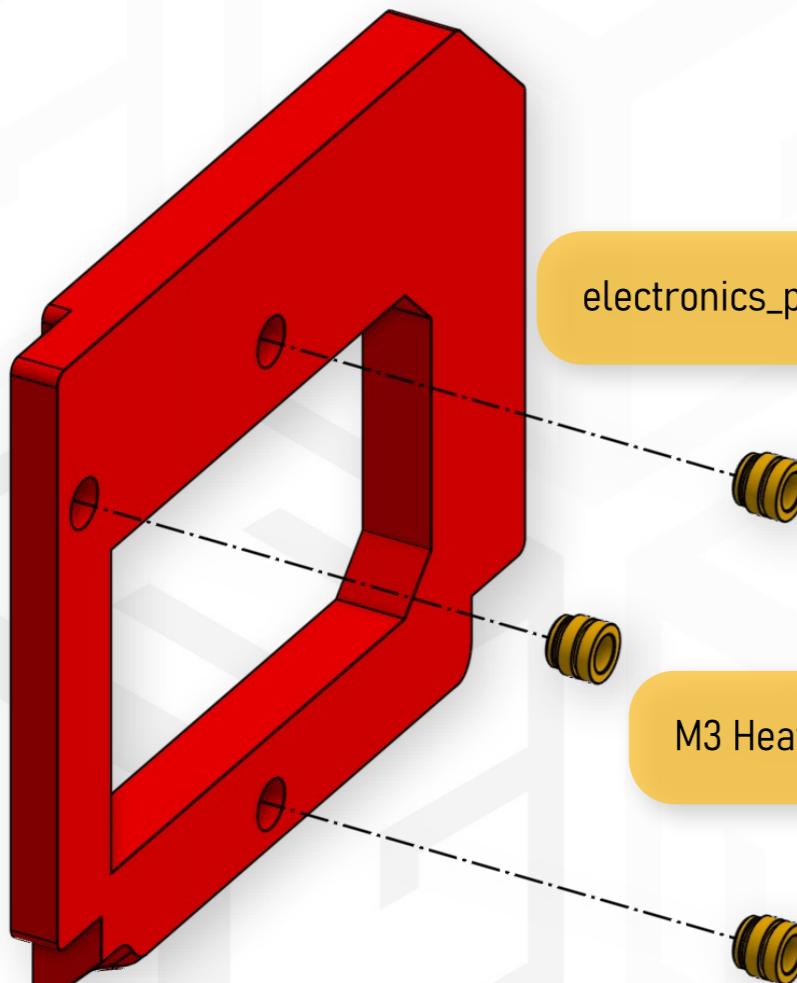
1x M3 T-Nut  
1x M4 T-Nut

D2F-L Microswitch

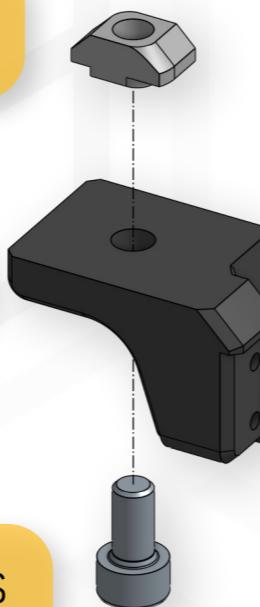
## PRINTED PARTS:

OR electronics\_power\_switch\_backer.stl  
electronics\_power\_switch\_e3v2\_backer.stl (for Ender 3 V2)

electronics\_panel\_cable\_cover\_right.stl  
electronics\_panel\_cable\_cover\_backer.stl



M4 T-Nut



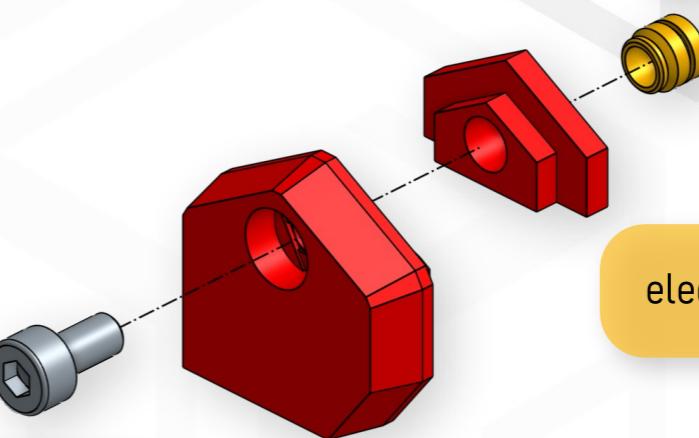
D2F-L microswitch

M2x10 SHCS

M4x8 SHCS

M2x10 SHCS

M3 Heat Set Insert



M3x6 SHCS

electronics\_panel\_cable\_cover\_right.stl

**WARNING: CAREFUL**  
Be careful when tightening the M2 screws as they screw directly into the plastic.

**TIP: ENDSTOP WIRES**  
For the Y endstop, wire the two side pins.  
( COM + NC )

**1 VS 2 CABLE COVERS**  
Based on your configuration, either assemble only the right cable cover or both left and right. Installation process for both sides is the same.

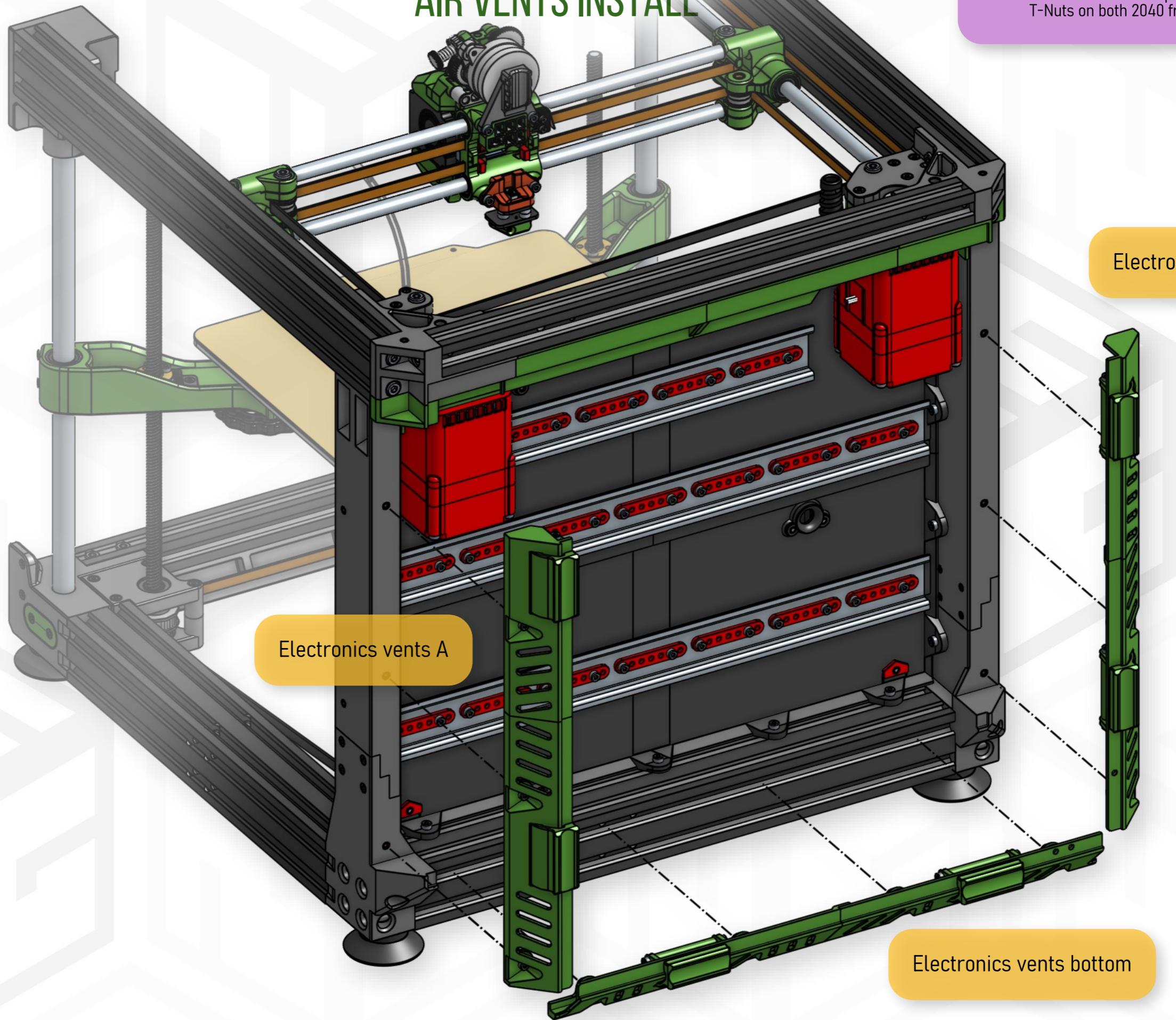
## TOOLS:

2.5 mm Allen key

# ELECTRONICS AIR VENTS INSTALL

## FRAME OPTIONS

With printed verticals, screw the air vents into the M3 heat inserts on side profiles while using T-Nuts on both 2040 frame versions.

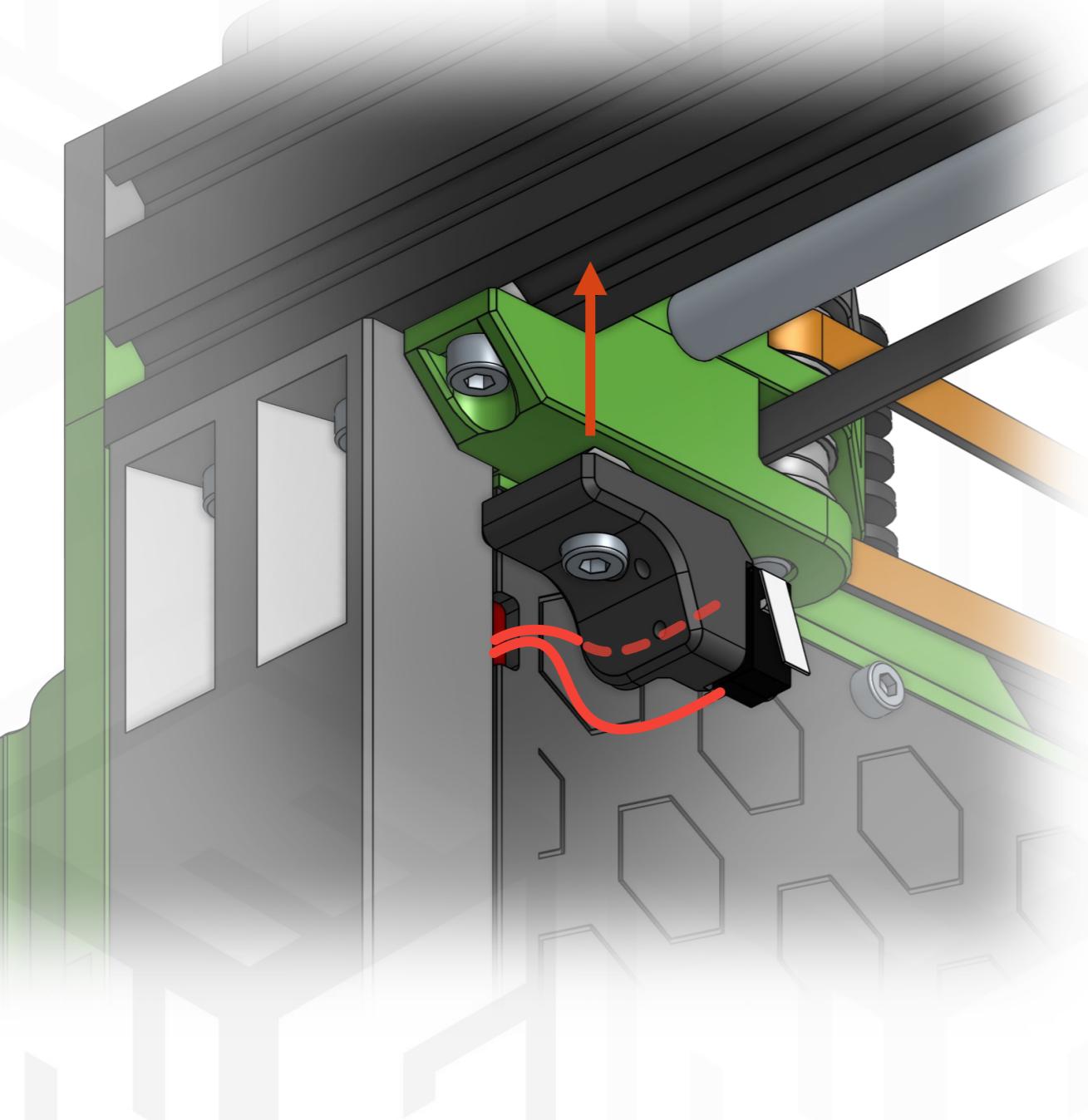


## TOOLS:

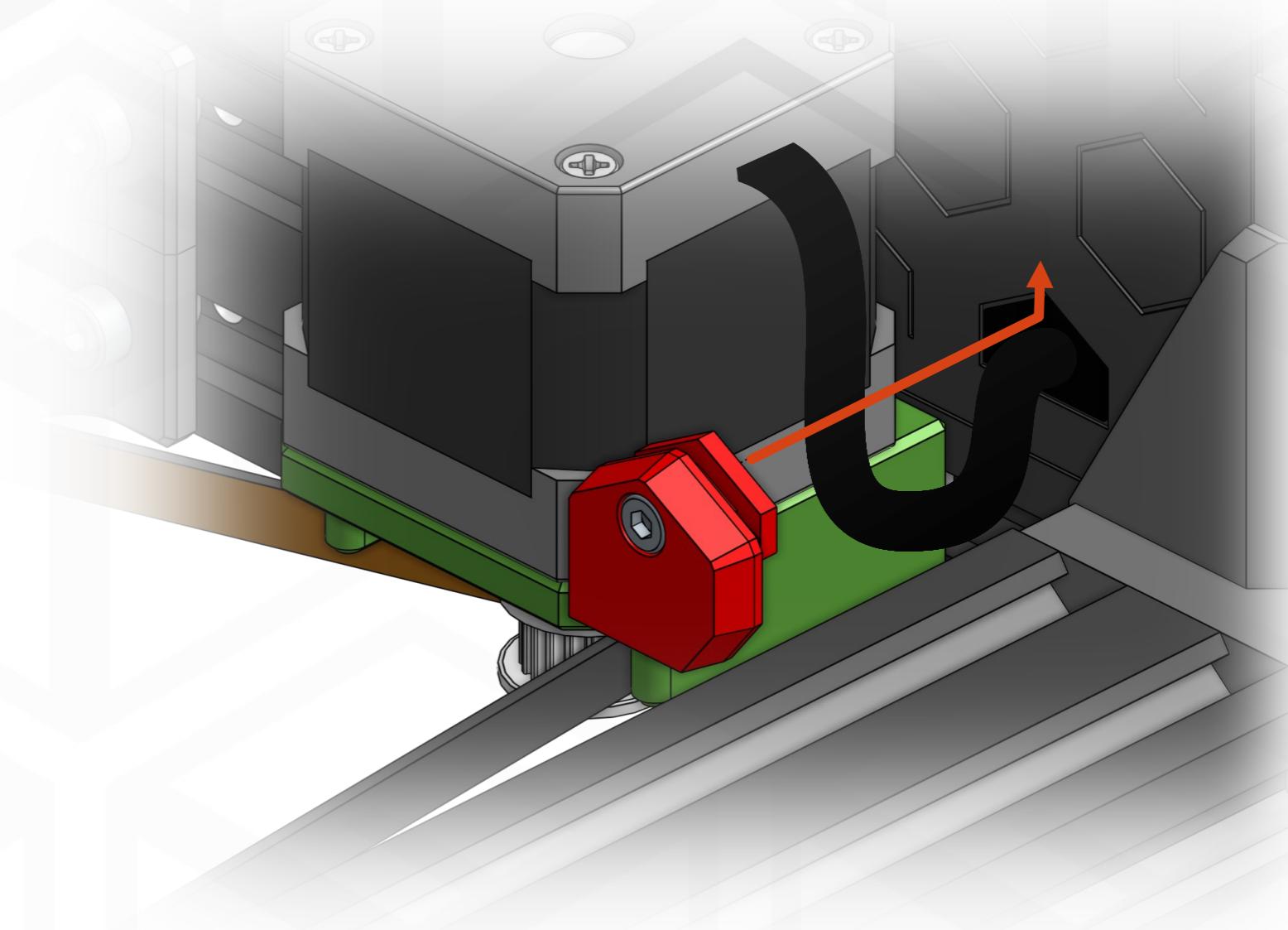
2.5 mm Allen key  
3 mm Allen key

# ELECTRONICS Y ENDSTOP + CABLE COVERS

Y ENDSTOP



Z STEPPER MOTOR WIRING COVER



### TIP: CABLE COVER

To install the cable cover, the hole needs to have clean edges.  
Insert the cable cover assembled, although with the screw being loose.  
Push it inside the hole and then upwards and tighten the screw.

## TOOLS:

2.5 mm Allen key

## HARDWARE:

3x M3x10 SHCS

Ziptie  
AC Power inlet / switch

## PRINTED PARTS:

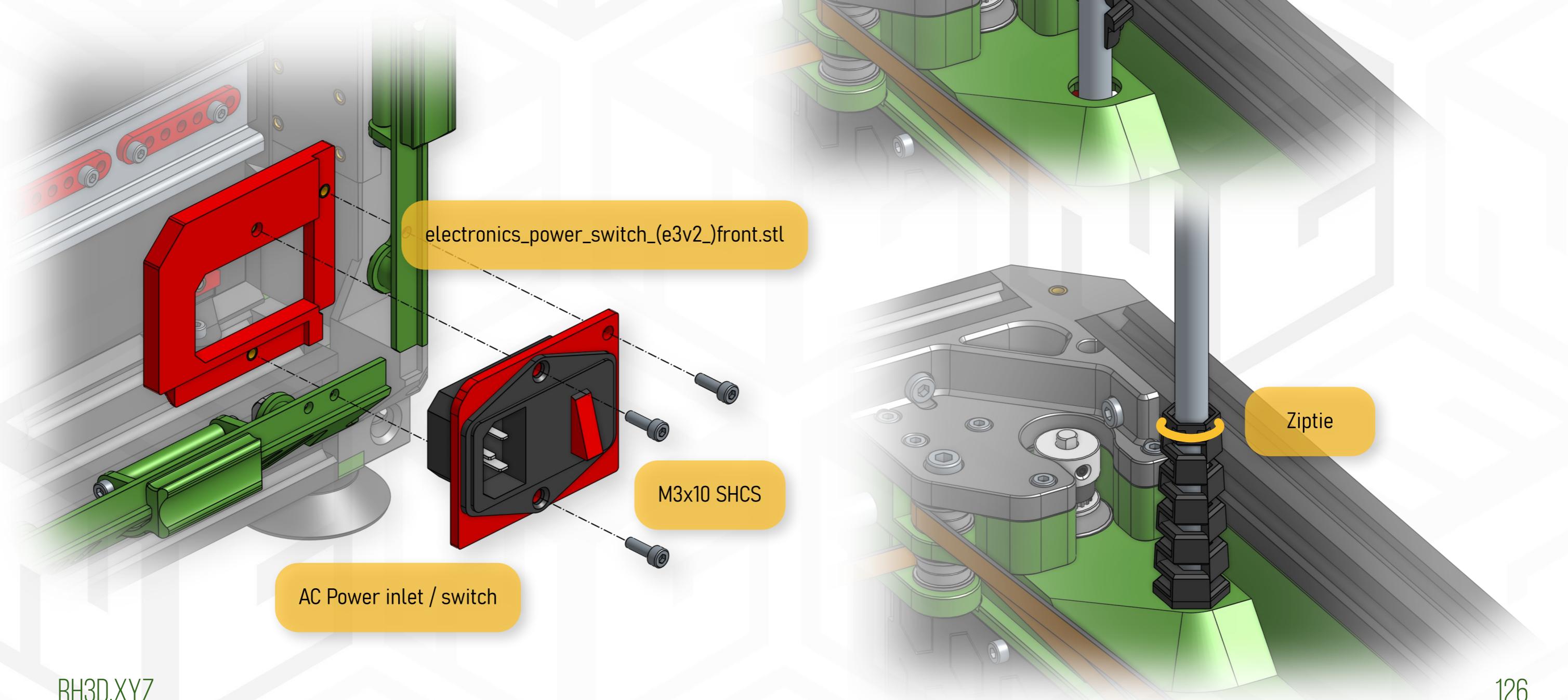
OR  
electronics\_power\_switch\_front.stl  
electronics\_power\_switch\_e3v2\_front.stl ( for Ender 3 V2 )

electronics\_cable\_gland\_1.stl  
electronics\_cable\_gland\_2.stl

# ELECTRONICS POWER INLET + CABLE GLAND

## TIP: CABLE GLAND

You can choose to install either the printed cable gland or the standard PG7 gland.



## TOOLS:

3 mm Allen key

## HARDWARE:

4x M4x8 SHCS

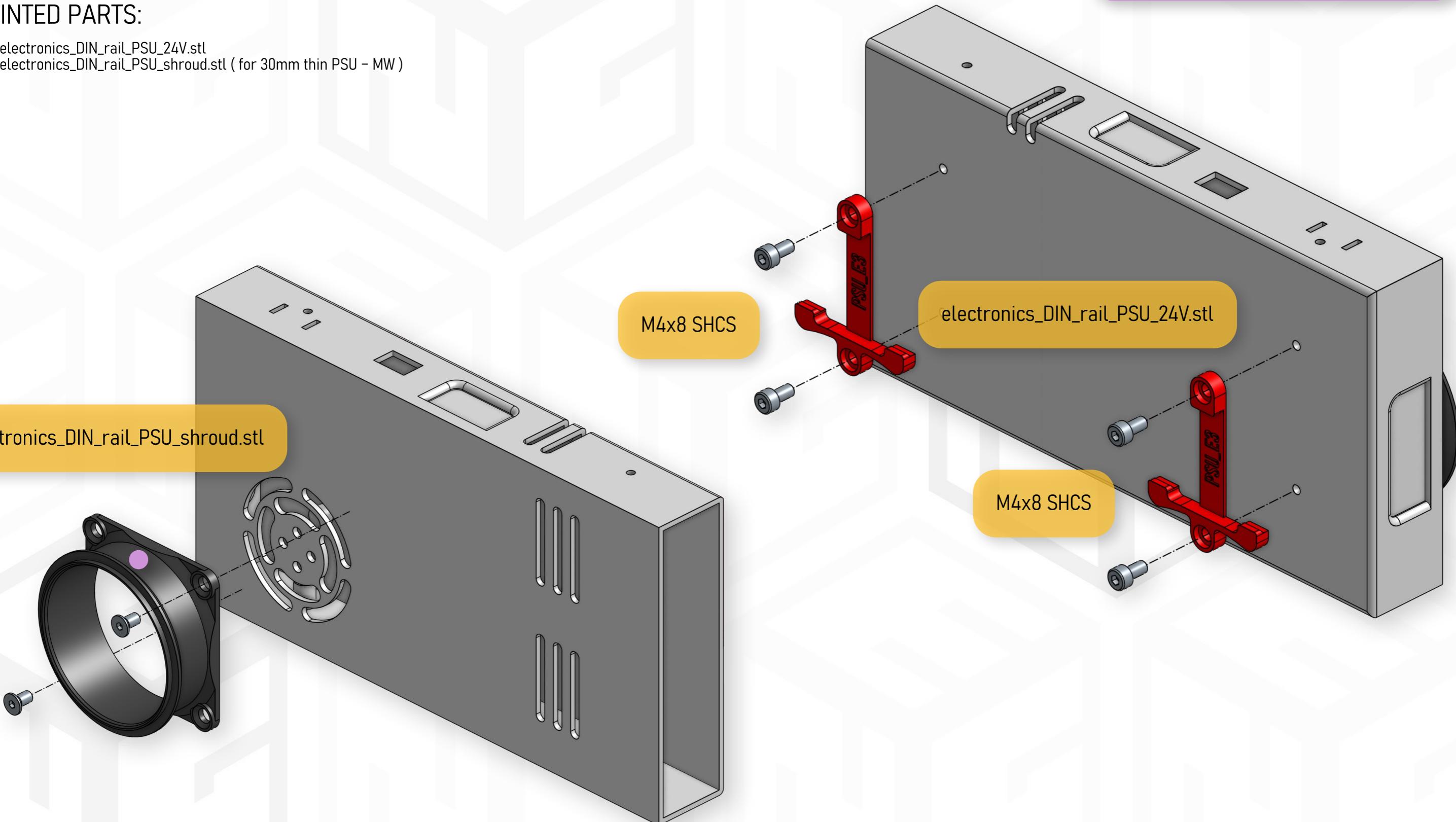
## PRINTED PARTS:

2x electronics\_DIN\_rail\_PSU\_24V.stl  
electronics\_DIN\_rail\_PSU\_shroud.stl ( for 30mm thin PSU - MW )

# ELECTRONICS POWER SUPPLY

## MEANWELL PSU

The fan shroud is installed only on Meanwell PSU ( 30 mm thick ) with the fan screws.  
50 mm thick PSU is installed without the shroud.



# BTT OCTOPUS

# ELECTRONICS MOTHERBOARD

## TOOLS:

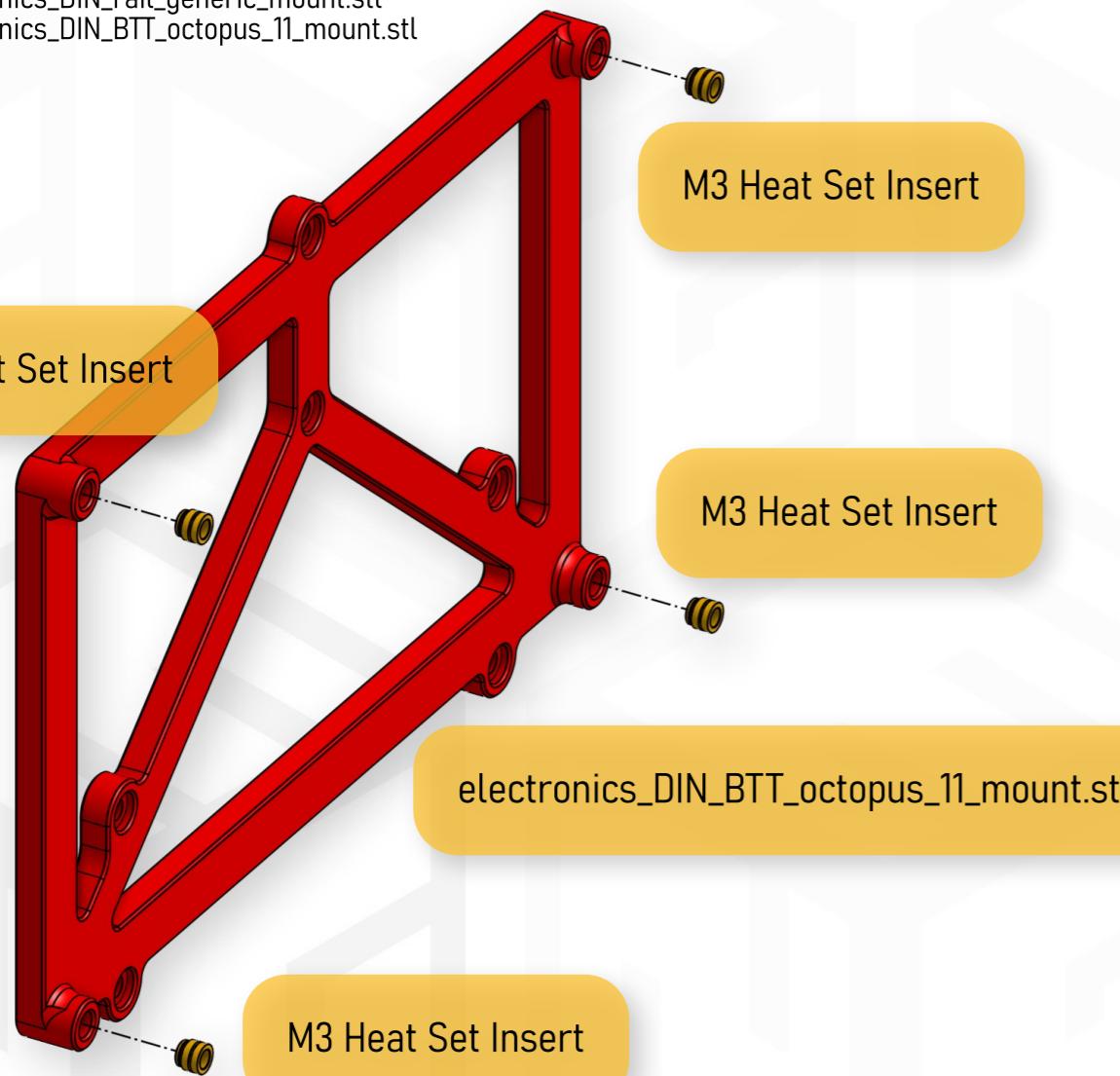
Heat set insert press  
Super glue  
Soldering iron + tools  
2.5 mm Allen key

## HARDWARE:

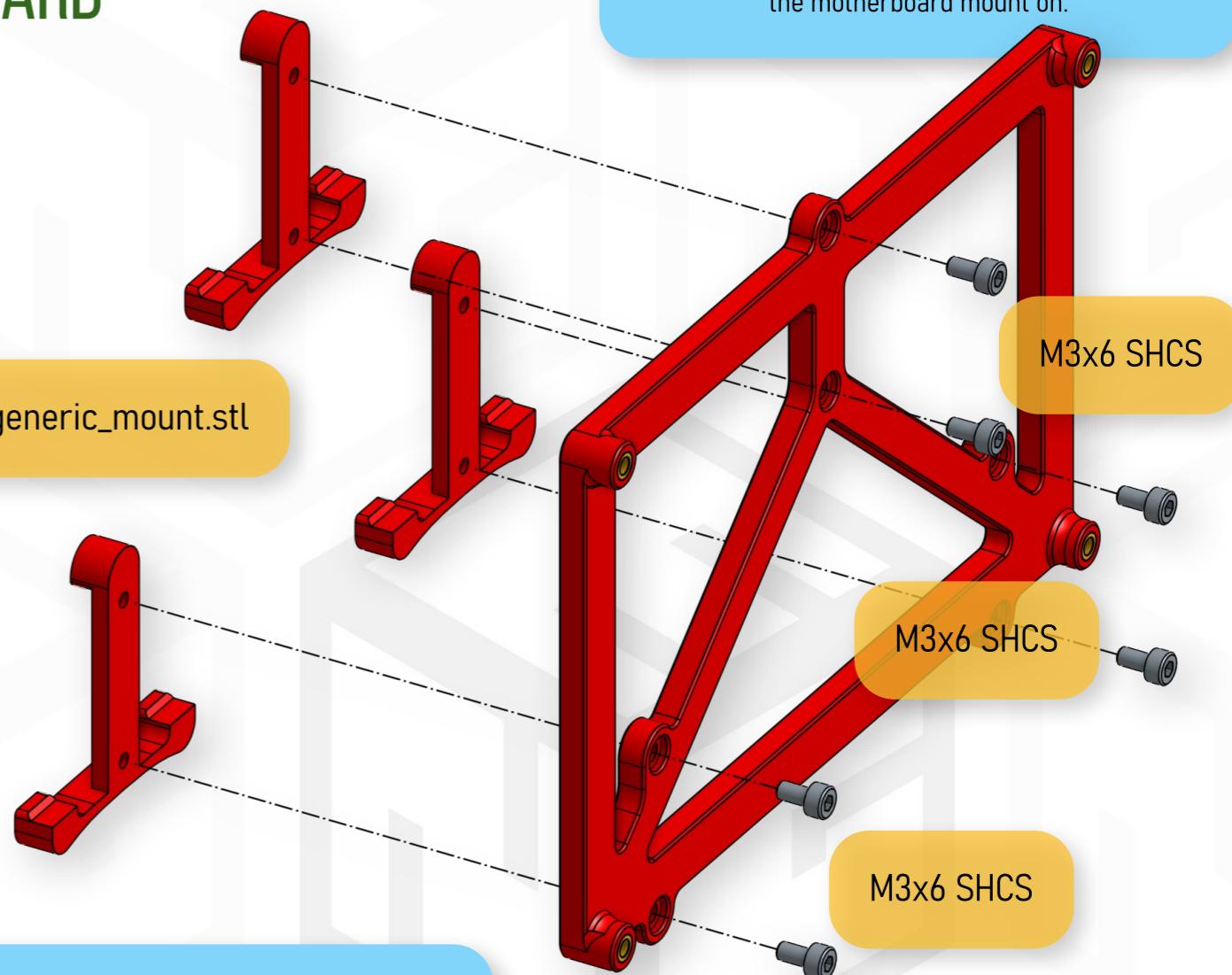
- 4x M3 Heat set insert
  - 6x M3x6 SHCS
  - 7x JST XH 2pin ( optional )

## PRINTED PARTS:

- 3x electronics\_DIN\_rail\_generic\_mount.stl  
electronics\_DIN\_BTT\_octopus\_11\_mount.stl

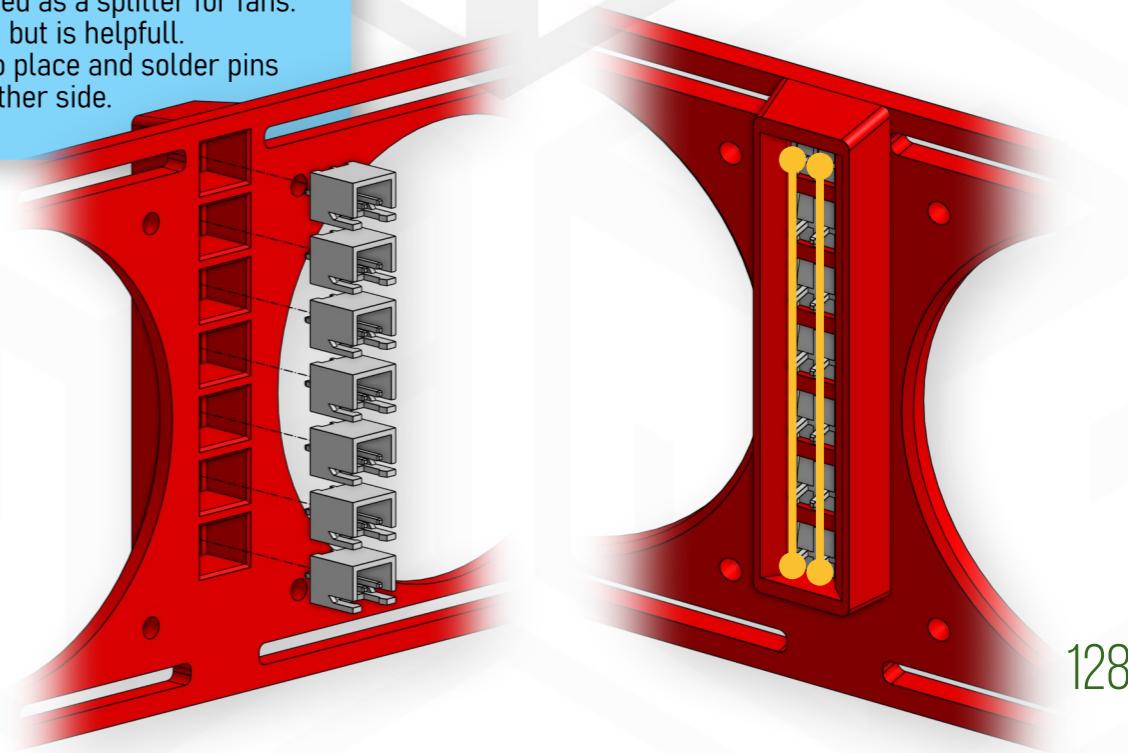


[electronics\\_DIN\\_rail\\_generic\\_mount.stl](#)



## TIP: OPTIONAL

JST XH connectors are used as a splitter for fans.  
It is not required but is helpfull.  
To install, glue them into place and solder pins  
from the other side.



RH3D.XYZ

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BTT OCTOPUS

# ELECTRONICS MOTHERBOARD

## TOOLS:

2.5 mm Allen key

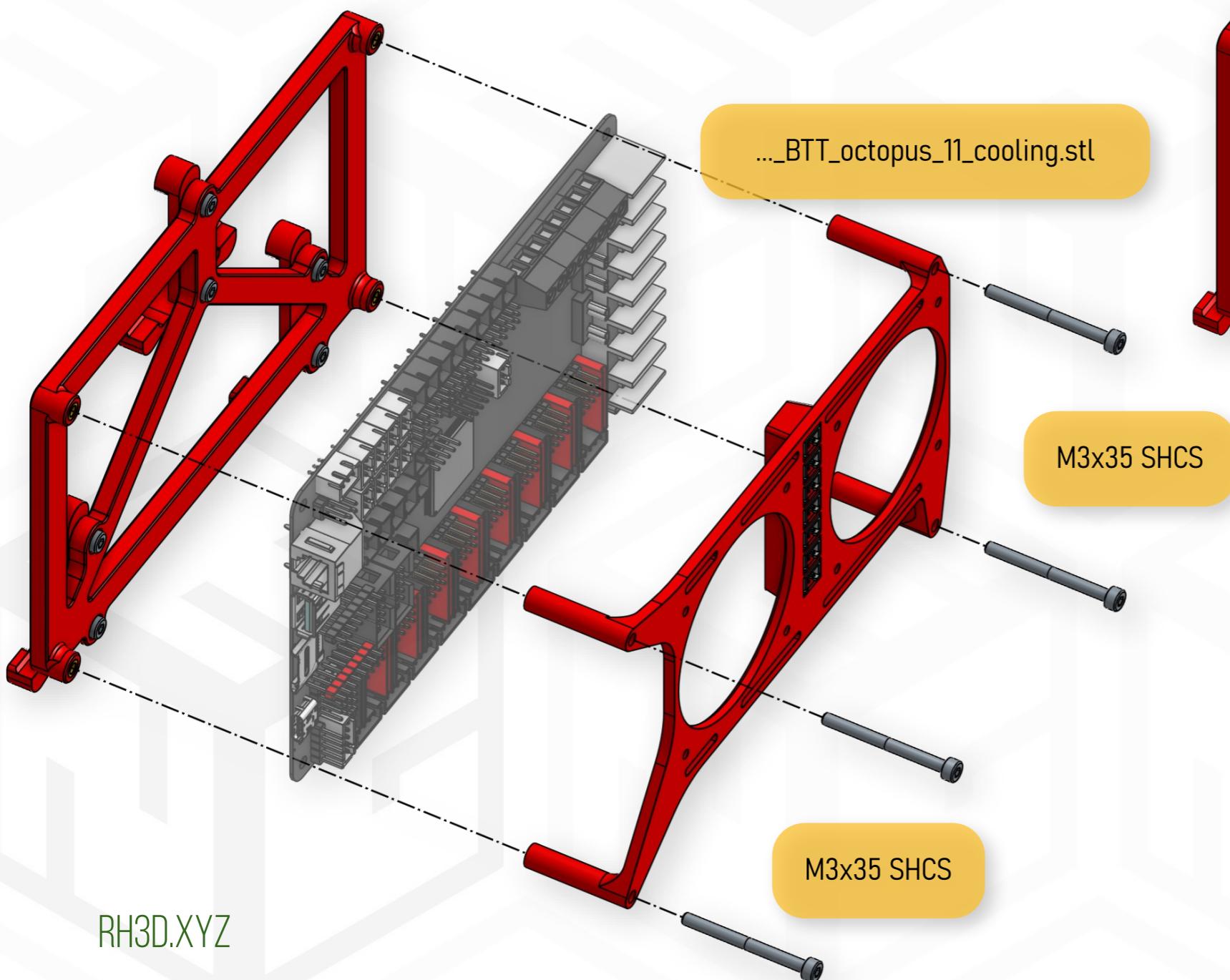
## HARDWARE:

8x M3x14 SHCS  
4x M3x35 SHCS

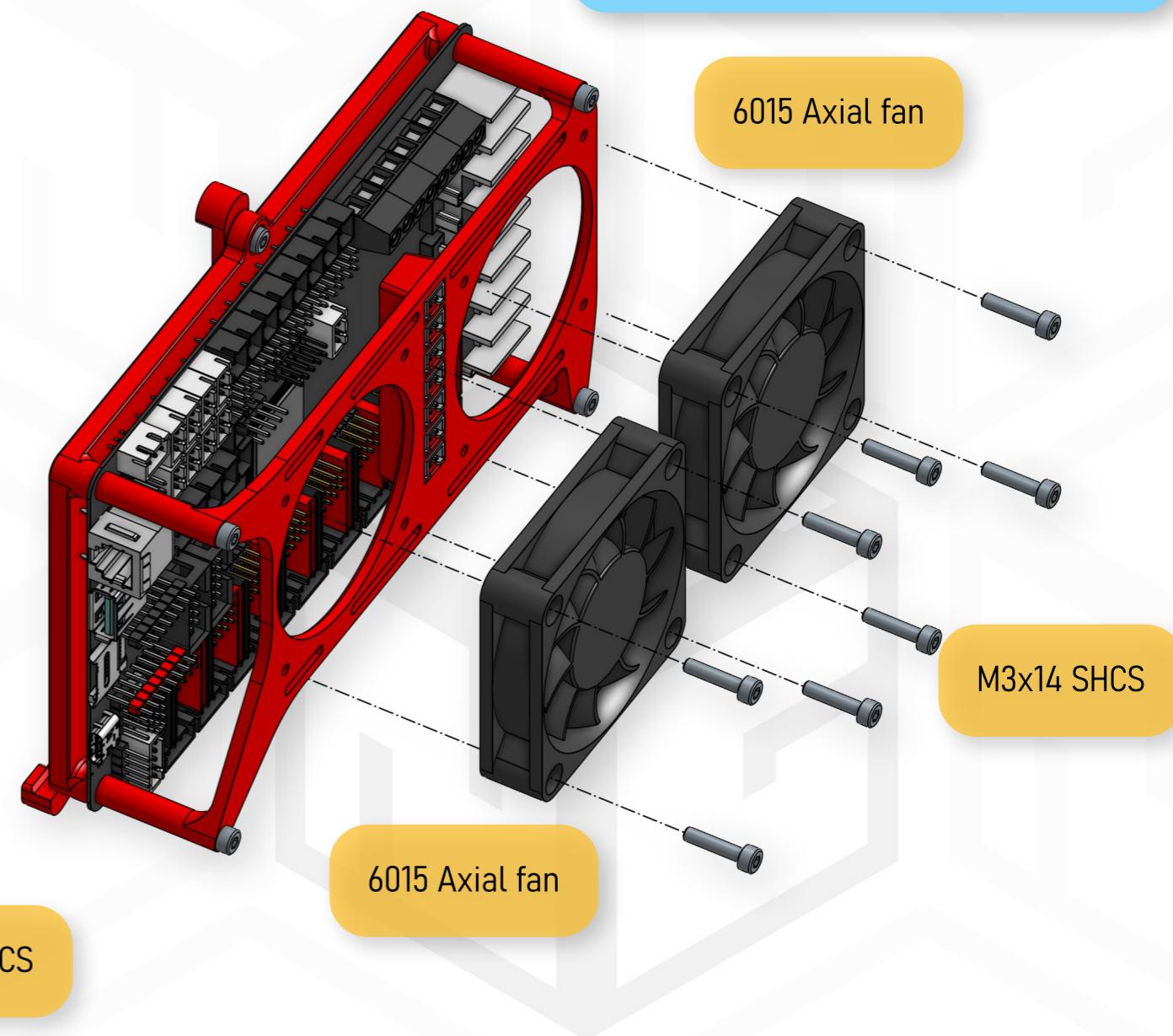
2x 6015 axial fan  
BTT Octopus

## PRINTED PARTS:

electronics\_DIN\_BTT\_octopus\_11\_cooling.stl



**TIP: MOTHERBOARD WIRING**  
For most of the wiring, you will need to remove the cooling part to access all the connectors.



# ELECTRONICS RASPBERRY PI

## TOOLS:

2.5 mm Allen key

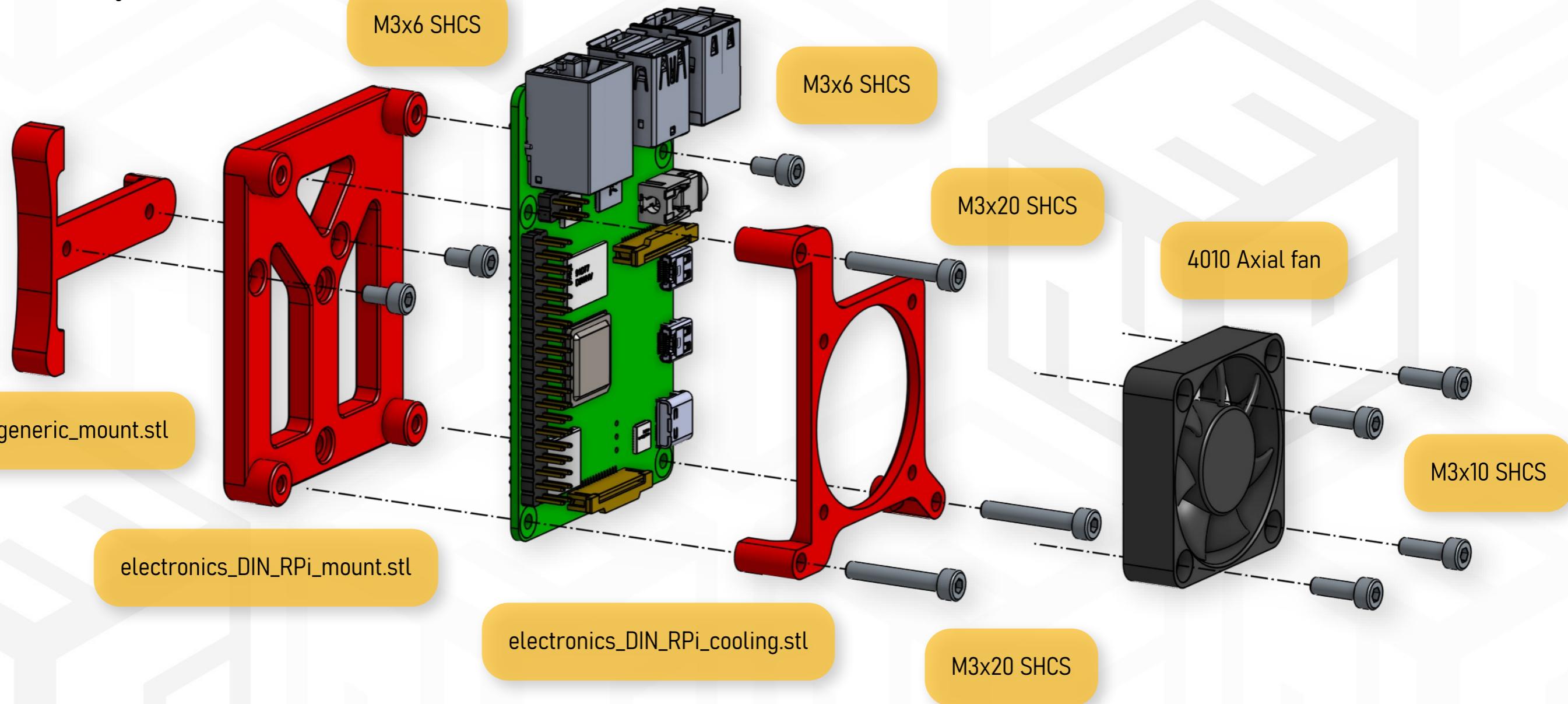
## HARDWARE:

3x M3x6 SHCS  
4x M3x10 SHCS  
3x M3x20 SHCS

2x 4010 axial fan  
Raspberry Pi

## PRINTED PARTS:

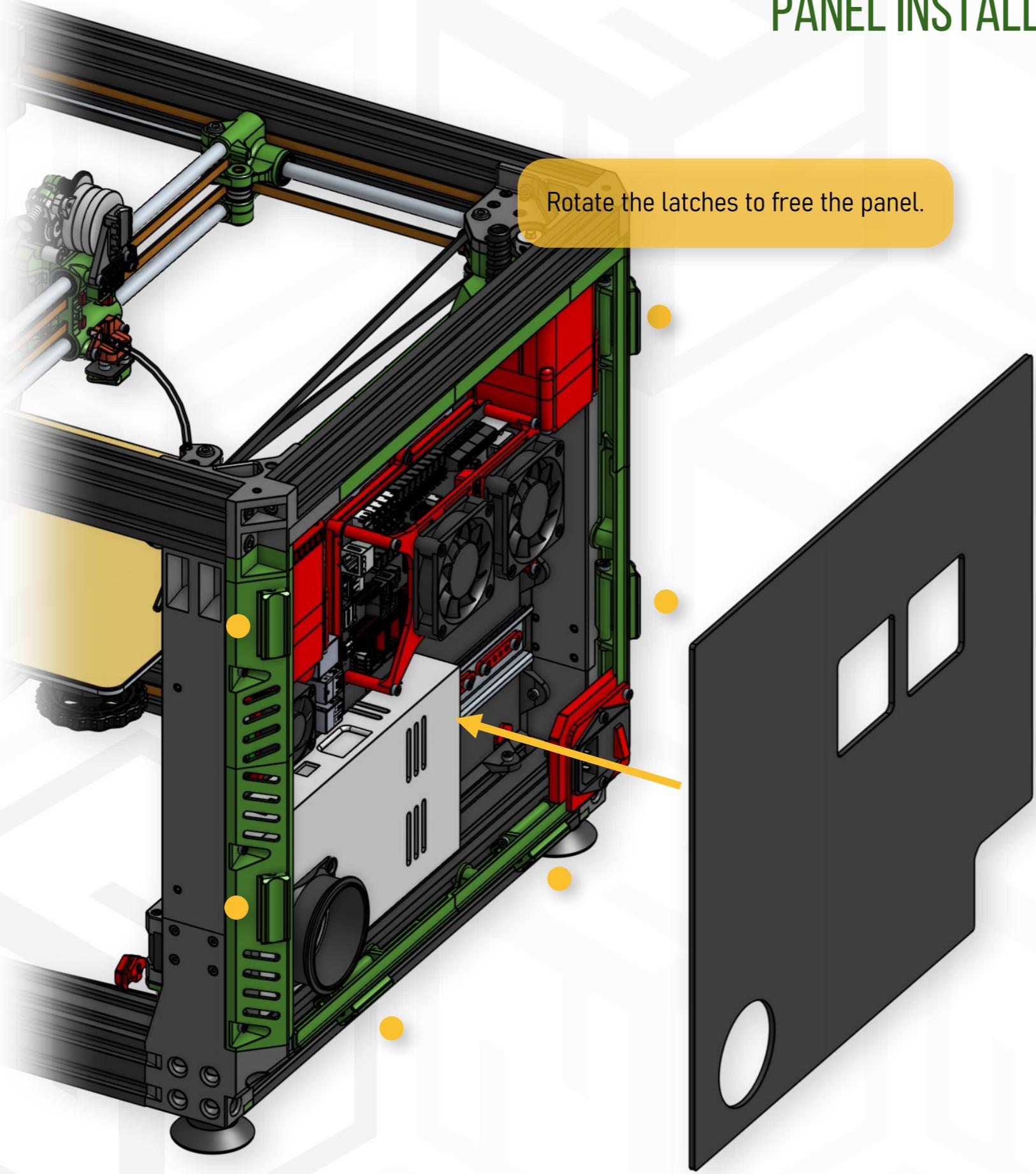
electronics\_DIN\_rail\_generic\_mount.stl  
electronics\_DIN\_Rpi\_mount.stl  
electronics\_DIN\_RPi\_cooling.stl



## TIP: POSITION OPTIONS

You can choose various positions for the generic DIN rail mount to optimise the electronics organisation.

# ELECTRONICS PANEL INSTALL



## TIP: FIRST INSTALL

To properly fit the panel, you will need to position the PSU and MB so the fans align with holes in the panel.

To align the 6015 fans, you might need to loosen the fan screws and move fans around to align properly before tightening again.

## WARNING: WIRING DIAGRAM

The scheme shows only a general idea of tracing and wiring the electronics, it is not meant to be a document to be followed precisely. Always proceed according to your specific setup, pay attention to polarity of wires and board connectors and use a proper wire thickness and insulation.

## WARNING: MAINS WIRING

Working on the mains wiring is dangerous and has to be done by a qualified professional and follow your local regulations.

## TIP: WIRE CONNECTORS

Always use adequate connectors crimped with a proper tool.  
Don't solder connectors that are designed to be crimped.

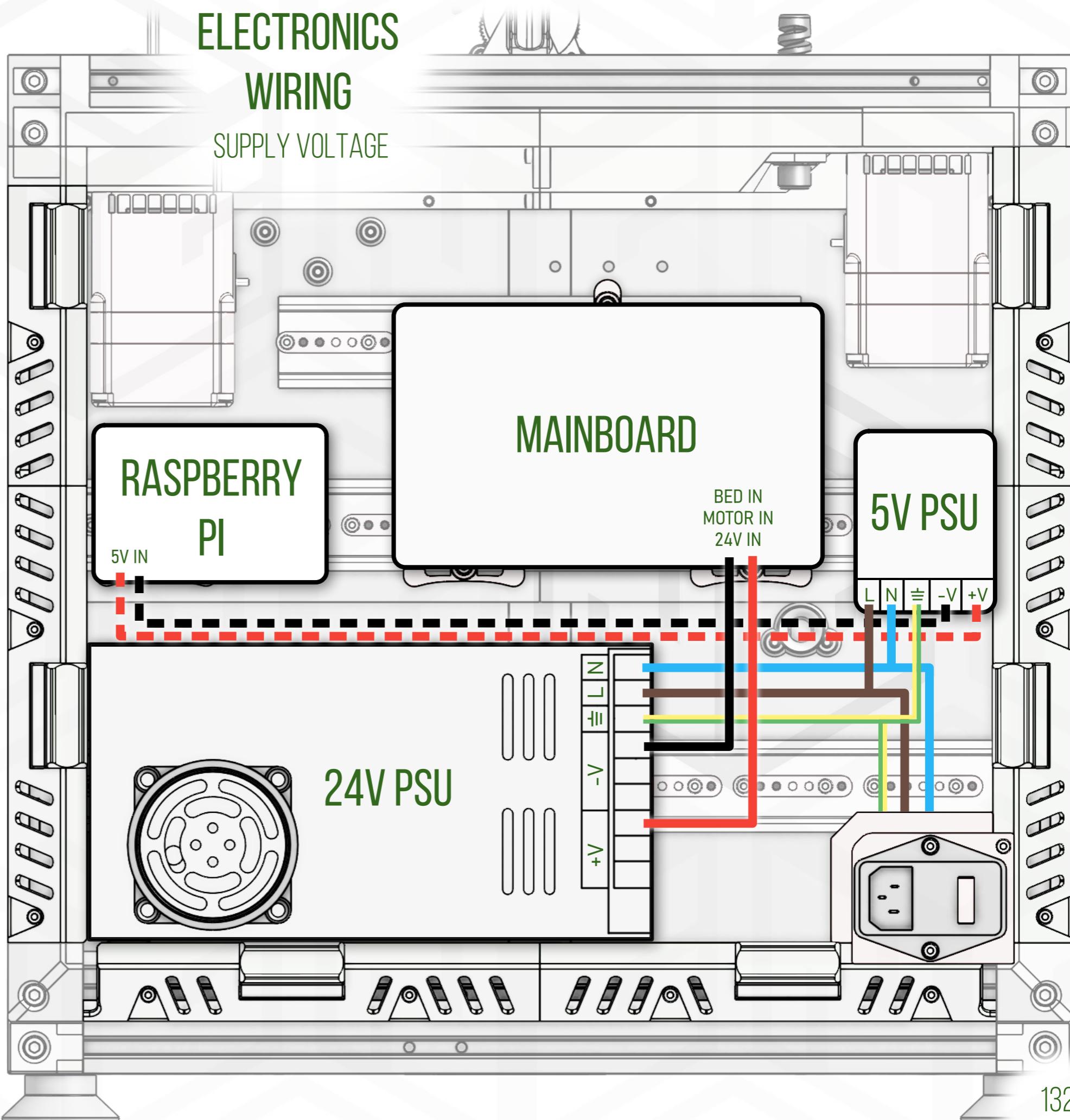
When wiring into screw terminal connectors, never use tinned wire ends but trim and strip the wire end and use either naked conductor or preferably a crimped ferrule connector.

## WIRING SCHEME LEGEND

—	AC - LIVE
—	AC - NEUTRAL
—	AC - GROUND
—	DC - 24V POSITIVE
—	DC - 24V NEGATIVE
—	DC - 5V POSITIVE
—	DC - 5V NEGATIVE

# ELECTRONICS WIRING

## SUPPLY VOLTAGE



## WARNING: WIRING DIAGRAM

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## TIP: WIRE CONNECTORS

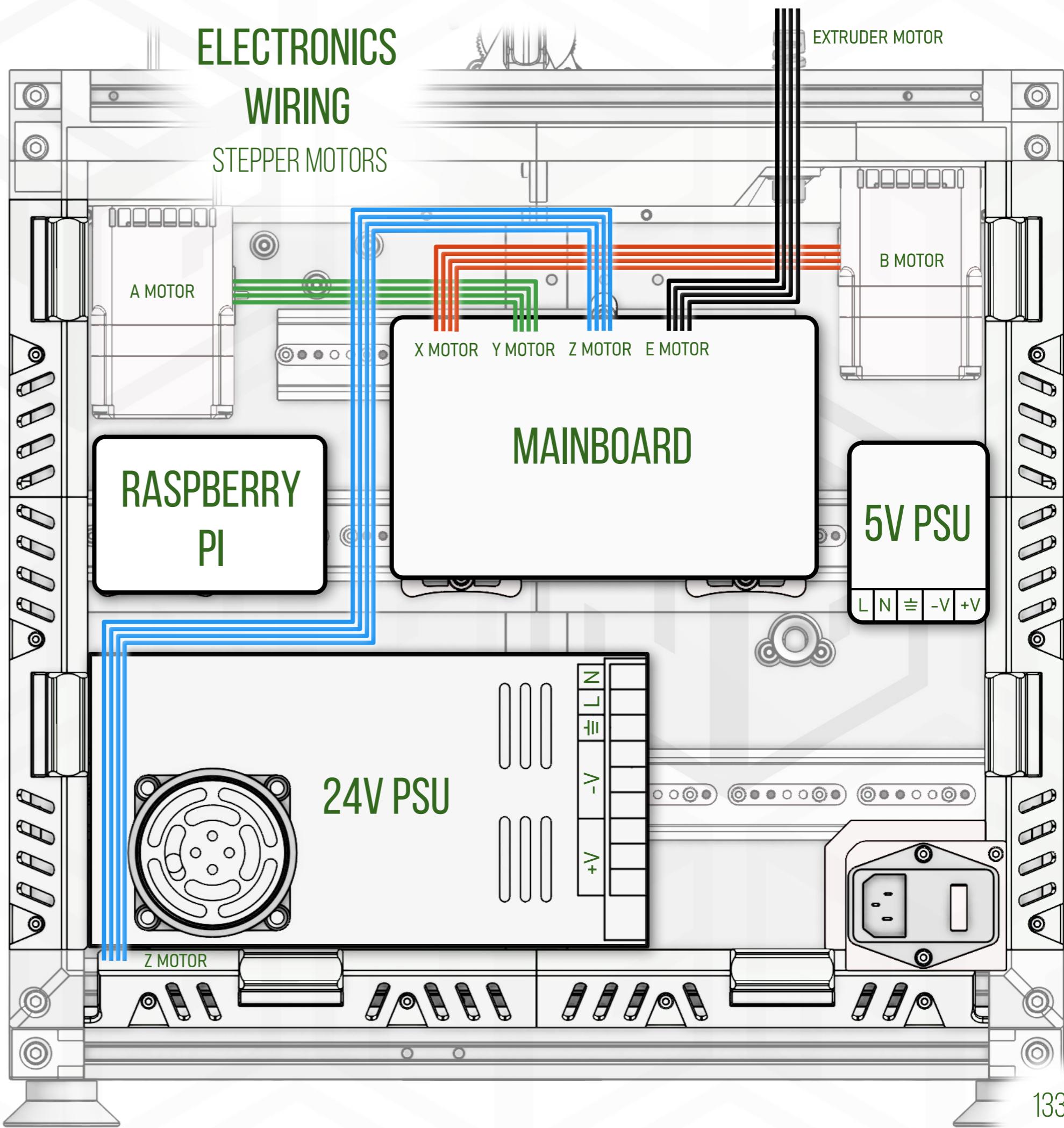
Always use adequate connectors crimped with a proper tool. Don't solder connectors that are designed to be crimped.

## WIRING SCHEME LEGEND

-  STEPPER MOTOR - B MOTOR - X DRIVER
-  STEPPER MOTOR - A MOTOR - Y DRIVER
-  STEPPER MOTOR - Z AXIS
-  STEPPER MOTOR - EXTRUDER

# ELECTRONICS WIRING

## STEPPER MOTORS



## WARNING: WIRING DIAGRAM

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## WIRING SCHEME LEGEND

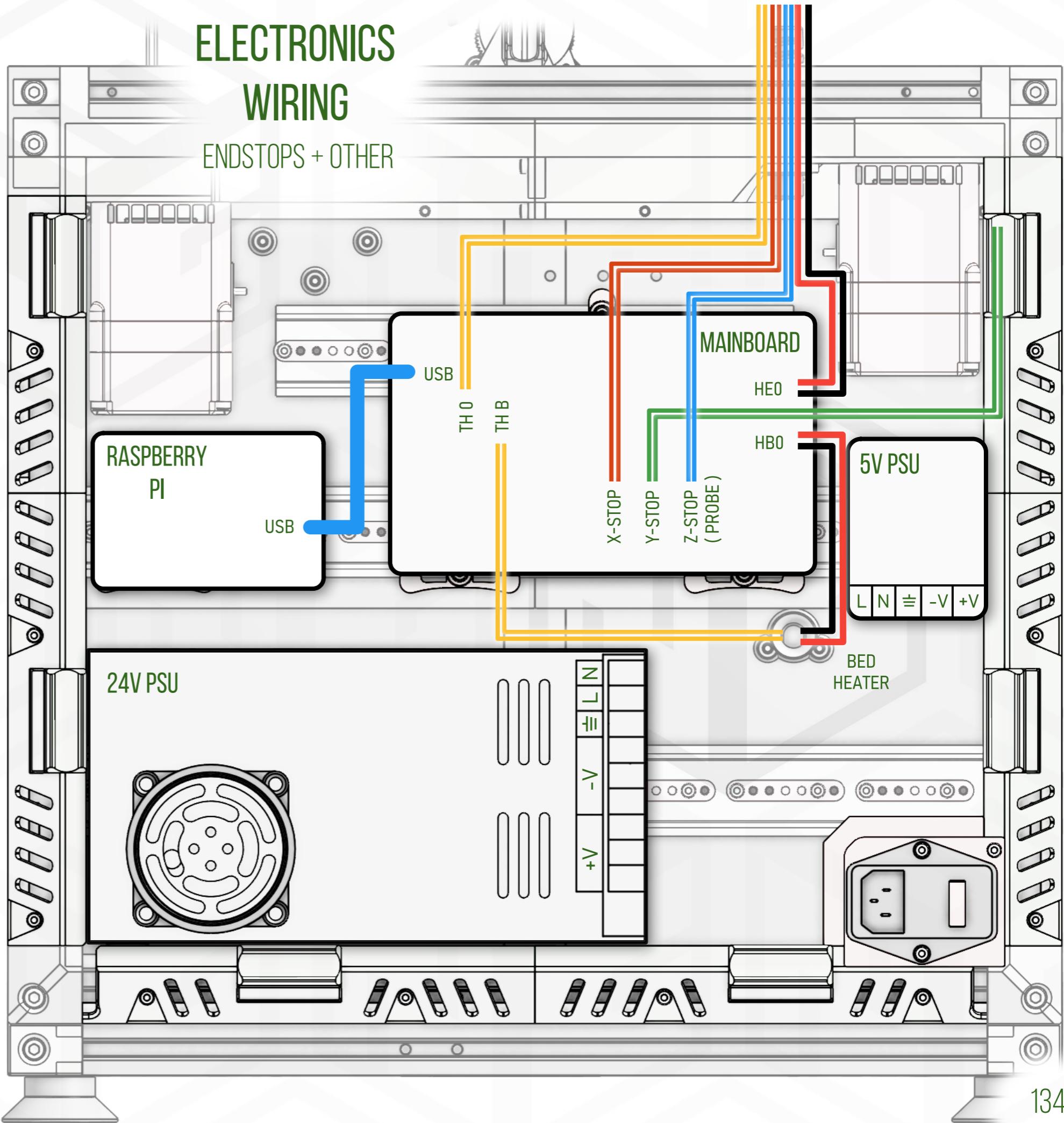
- USB CONNECTION
- HEO - 24V HOT END HEATER (polarity not important)
- HBO - 24V BED HEATER (polarity not important)
- TH 0 - HOT END THERMISTOR
- TH B - BED THERMISTOR
- X-STOP - X MIN ENDSTOP
- Y-STOP - Y MAX ENDSTOP
- Z-STOP - BED PROBE

## FIRMWARE SETTINGS

- X HOMING (verify before the first use)  
X\_MIN = ENDSTOP POSITION = 0 mm  
X\_MAX = 233 mm
- Y HOMING (verify before the first use)  
Y\_ENDSTOP POSITION = 248 mm  
Y\_MIN = 0 mm  
Y\_MAX = 235 mm
- Z HOMING (verify before the first use)  
Z\_MAX = ~ 248 mm for short hotend  
~ 240 mm for medium hotend  
~ 234 mm for long hotend

# ELECTRONICS WIRING

## ENDSTOPS + OTHER



## WARNING: WIRING DIAGRAM

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## TIP: WIRE CONNECTORS

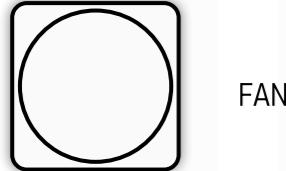
Always use adequate connectors crimped with a proper tool. Don't solder connectors that are designed to be crimped.

## TIP: MULTIPLE FANS

To wire in the controller, stepper motor cooling and part cooling fans, you will need to use Y splitter for the JST XH connectors or join the wires together in parallel.

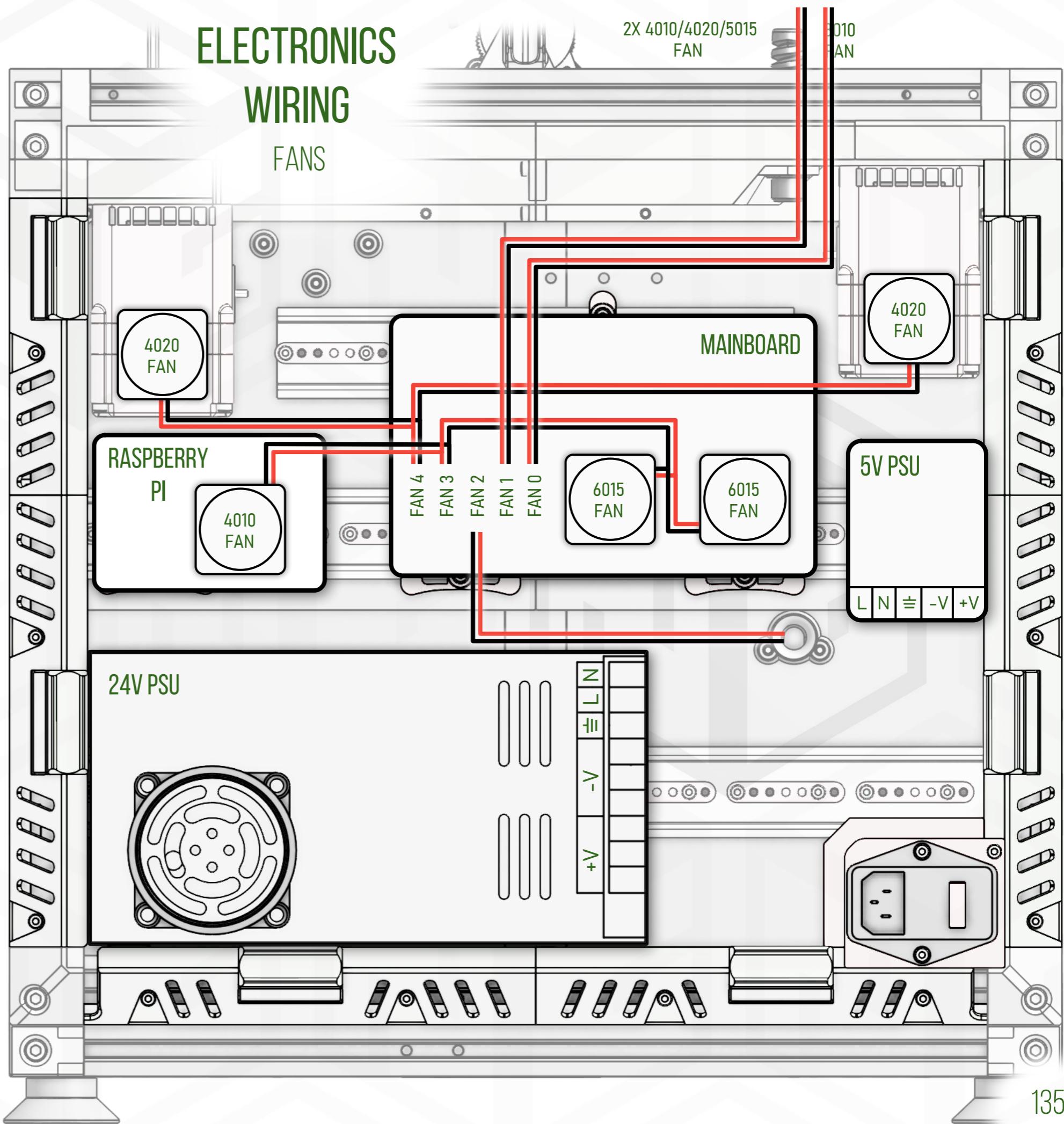
## WIRING SCHEME LEGEND

 24V FAN WIRE



- FAN 0 - Hotend cooling fan ( CNC FAN )
- FAN 1 - Part cooling fan ( CNC FAN )
- FAN 2 - Bed circulation fan ( CNC FAN )
- FAN 3 - Controller fan
- FAN 4 - Stepper motor cooling

# ELECTRONICS WIRING



# FINAL STEPS

## CONGRATULATIONS!

You have just finished the base build of the E3NG!  
I hope you enjoyed the build and I want to thank you for being part of this project, since users are one of the key elements of every great project!

After you finish the wiring, your next step will be installing the firmware and doing the printer calibration.

For some motherboard specific wiring look at the website,  
where you will also find the firmware files:

KLIPPER  
MARLIN

For the printer calibration, follow the same steps as calibrating your printer before printing parts for the project on [PAGE 4](#) of the build guide.

In the upcoming part 2 of the build manual, there will be guide to install the enclosure and other optional parts.

If you would like to share your build process, printer pictures or just be part of the community, come to the Discord server,  
we will be happy to have you there and see your printer!

Happy printing.

Radek @RH3D

This build manual is the first public release, so if you have found any mistakes or have any recommendations, your feedback will be very welcome.

[FEEDBACK](#)

## THANK YOU!