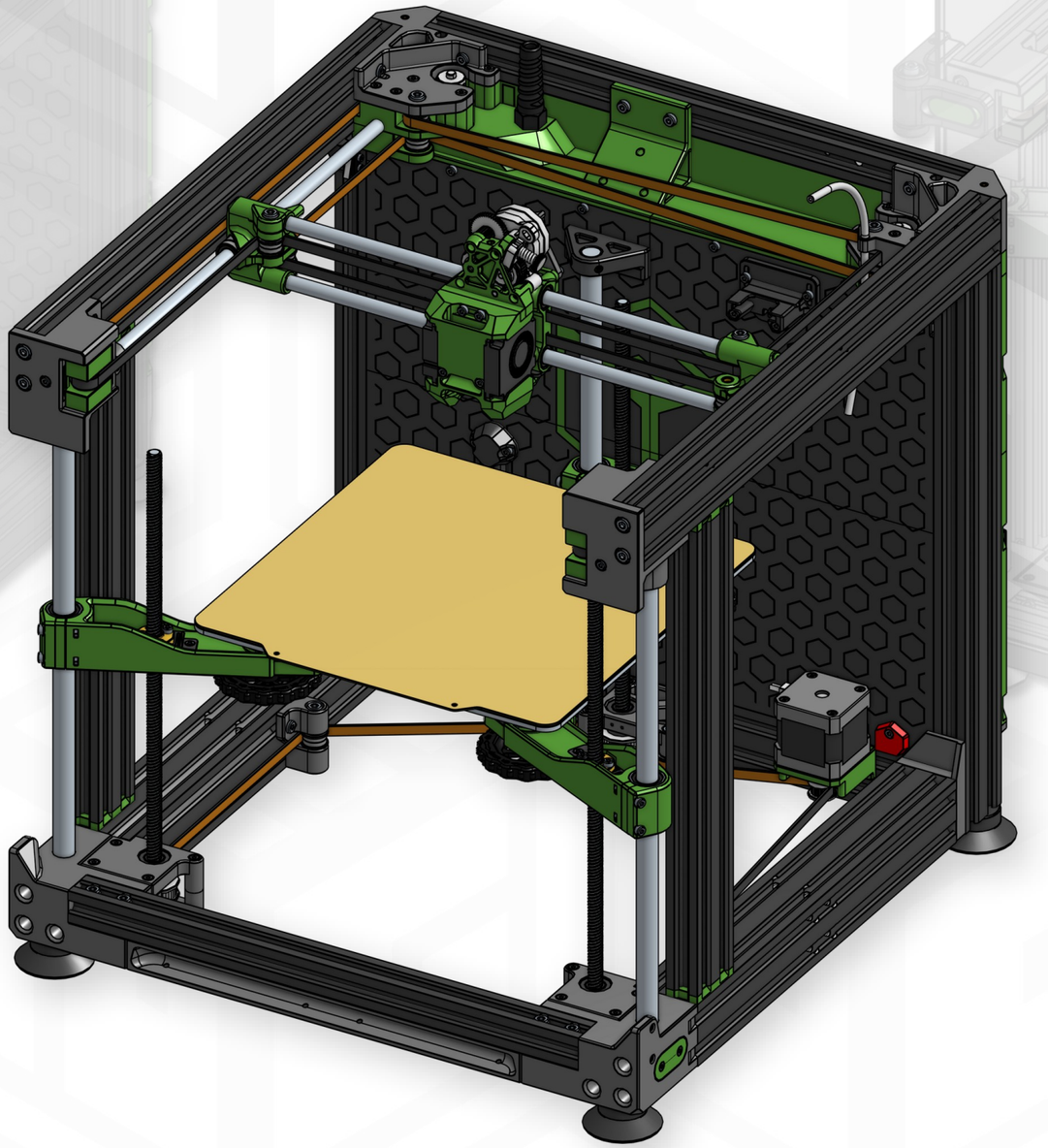
ENDER 3 NG V1.2S

BUILD GUIDE RECOMMENDED VERSION



DESIGNED BY RH3D

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VERSION 0.1S-2025/06

INTRODUCTION

This is the build guide made for the standard version (E3NG v1.2S) which is used for kits as well as being recommended to start with.

If you want to customize your printer, look at the E3NG v1.2 (advanced) version which has many available options to configure your build, but you will have to invest a bit more time to study all the optional features. Everything is compatible though so you can leave it for the future.

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 E3NG, 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.

Before beginning to print parts, you should first read through the website 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, 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 dirtdigger
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.

E3NG - 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

FREQUENTLY ASKED QUESTIONS

CHOOSE YOUR COLOR SCHEME

BUILD GUIDE CONTENT

The current version of the build guide includes the build of the base printer in the recommended configuration. It doesn't include the enclosure assembly or other optional parts.

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.

VERSION SPECIFIC NOTE:
This note indicates a specific step, which applies only to certain version/option.
If this doesn't apply to your build, skip the step.

When it's on the left top corner, 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 metal (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

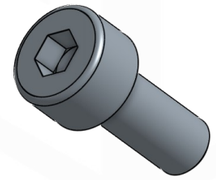
TERMINOLOGY USED IN THE GUIDE

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.

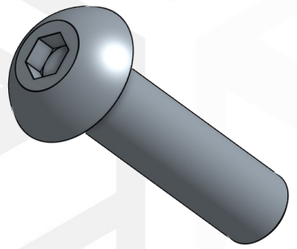
M4 thread, 10mm thread length.



M5x20 BHCS

Button head cap screw.

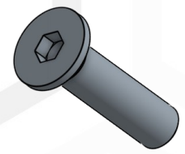
M5 thread, 20mm thread length.



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.

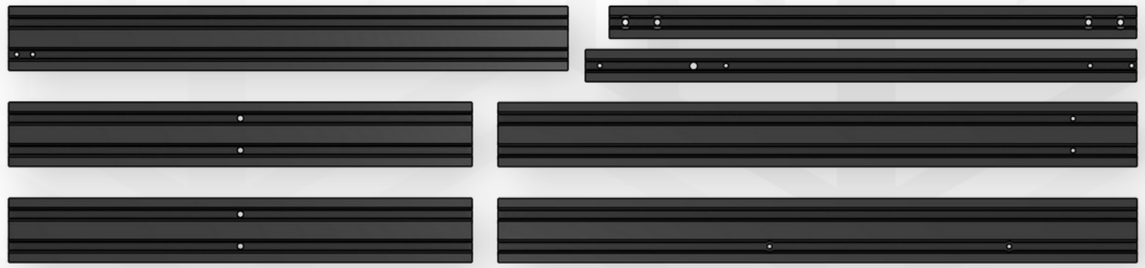
PARTS PREPARATION

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 and have it compatible with various Ender 3 versions.

The extrusion end holes also need to be tapped with M5 thread. Usually only the original X axis extrusion isn't tapped.

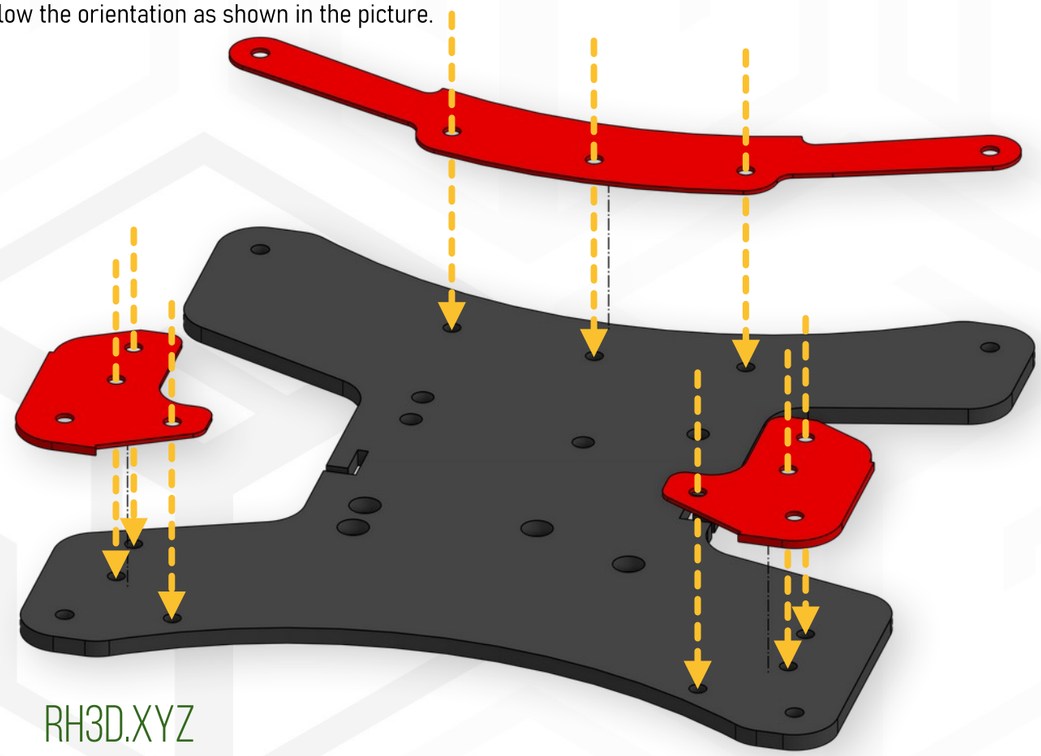


BED CARRIAGE

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 to mark the hole positions.:

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.



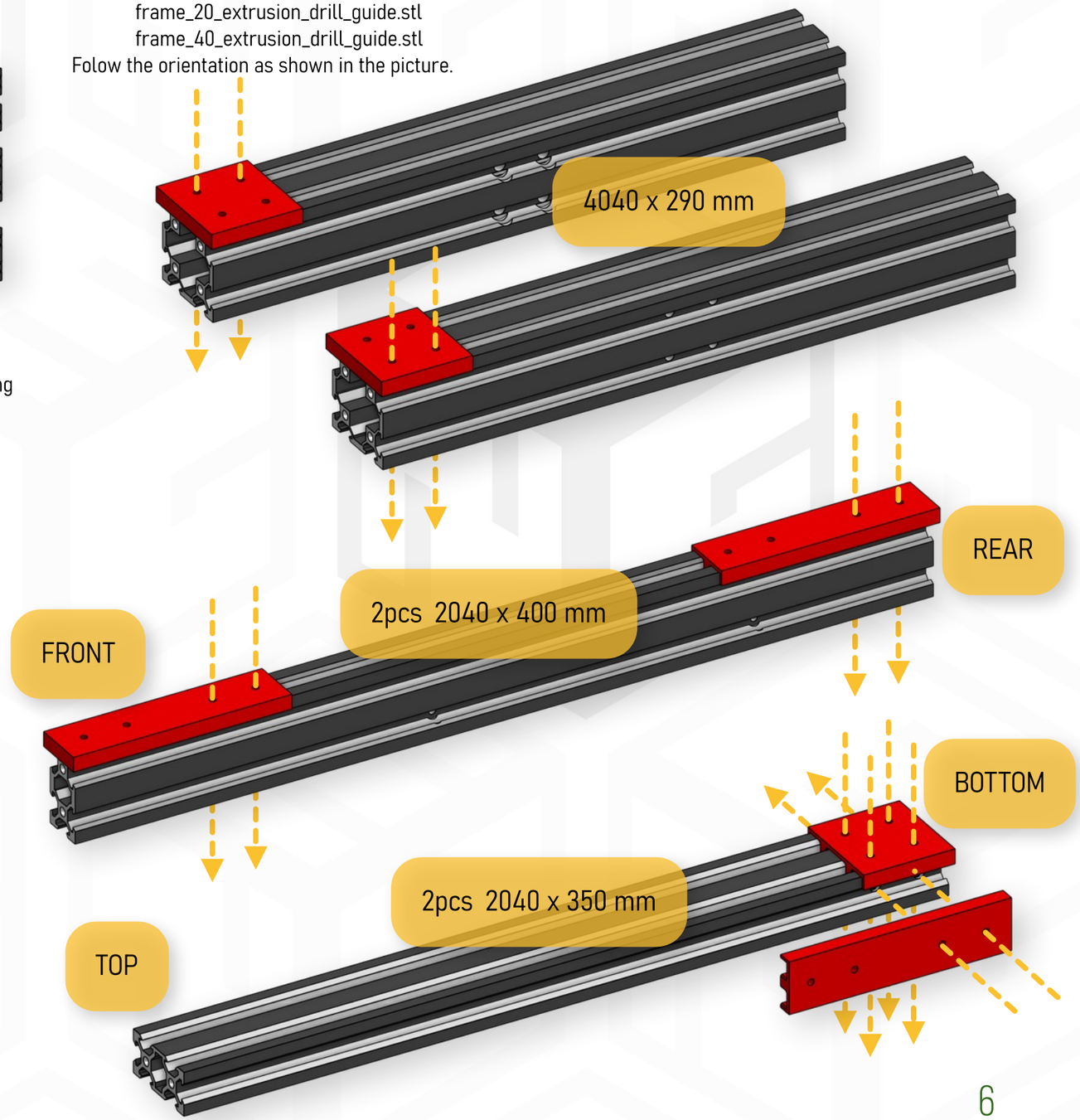
BLIND JOINTS

Make sure all the extrusion end holes have M5 threads. You will also need to drill 4mm (or larger) holes in the extrusions using the printed drill templates. To achieve the best result, use the template from both sides (always drill through only half of the extrusion) and use the template only to start the hole - finish without the template).

Use the following printable templates:

frame_20_extrusion_drill_guide.stl
frame_40_extrusion_drill_guide.stl

Folow the orientation as shown in the picture.



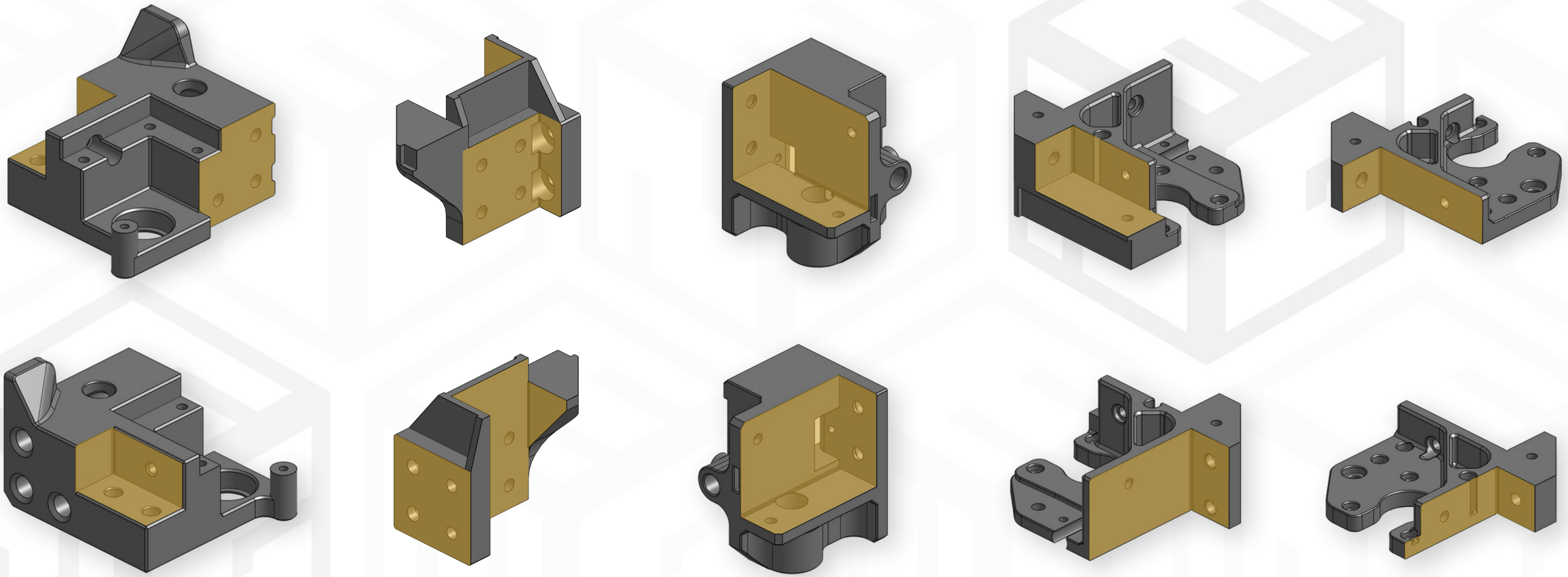
PARTS PREPARATION

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 flush out the internal channels. If the solvent becomes significantly contaminated, you can replace it with clean one and 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 well 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

BOTTOM FRAME
FRONT CORNERS

INSTALLING HEAT SET INSERTS

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

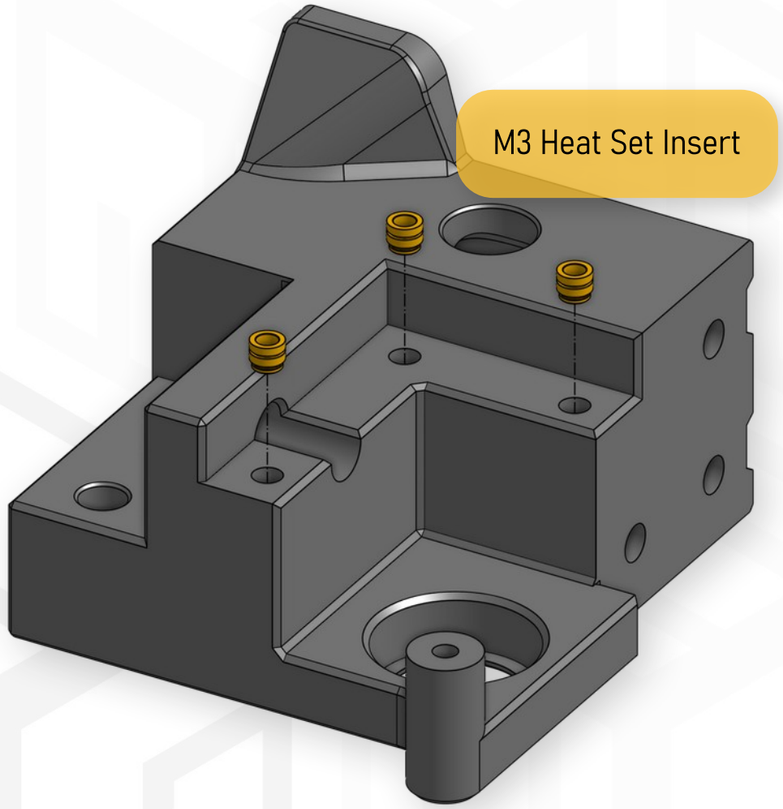
NOTE: SYMMETRY

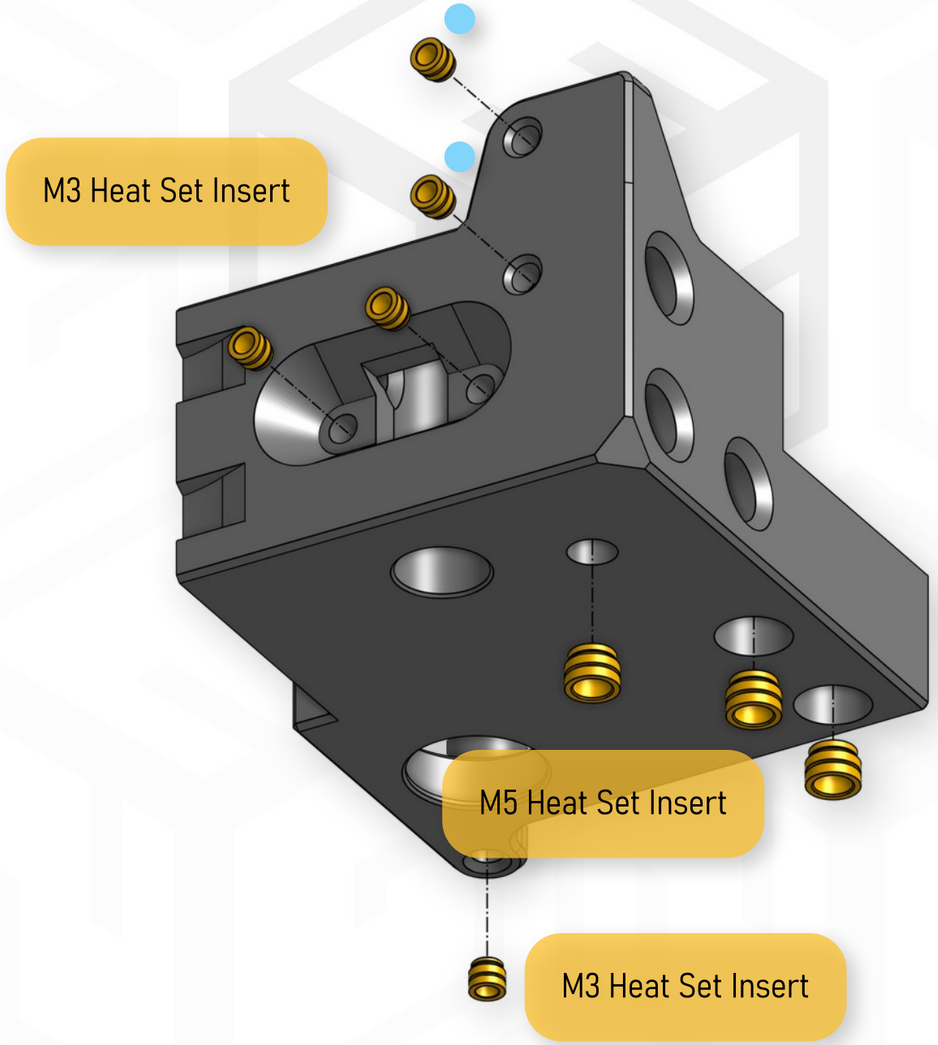
Left and right front corners are symmetrical, therefore only one side is shown in the build guide.

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.





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

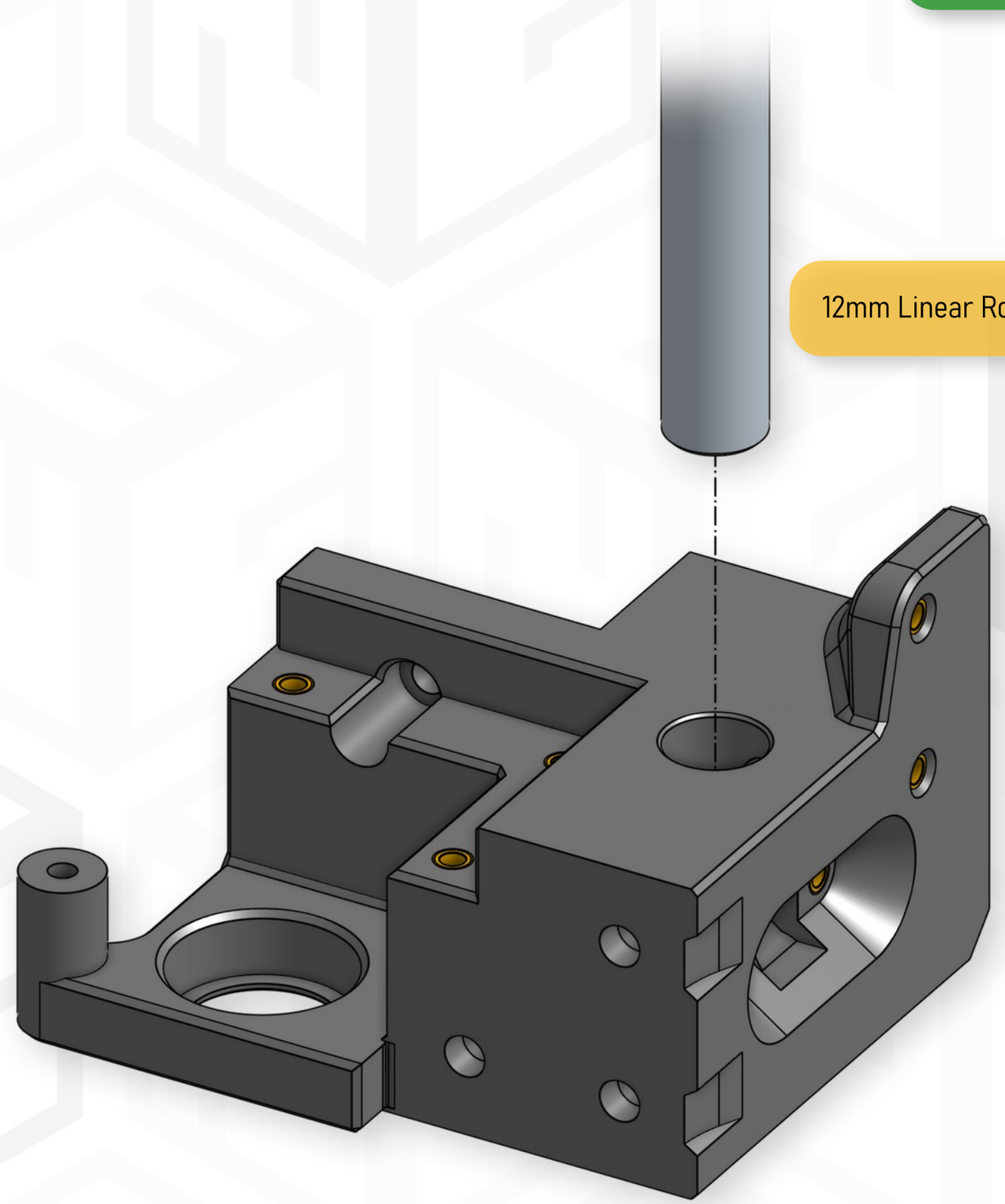
BOTTOM FRAME FRONT CORNERS

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.



BOTTOM FRAME
FRONT CORNERS

TOOLS:

2.5 mm Allen key
3 mm Allen key

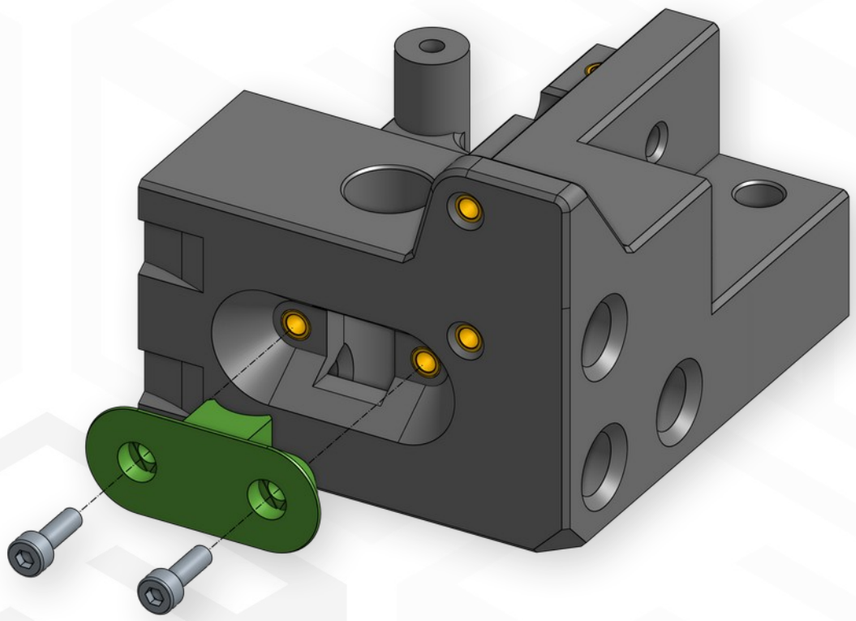
HARDWARE:

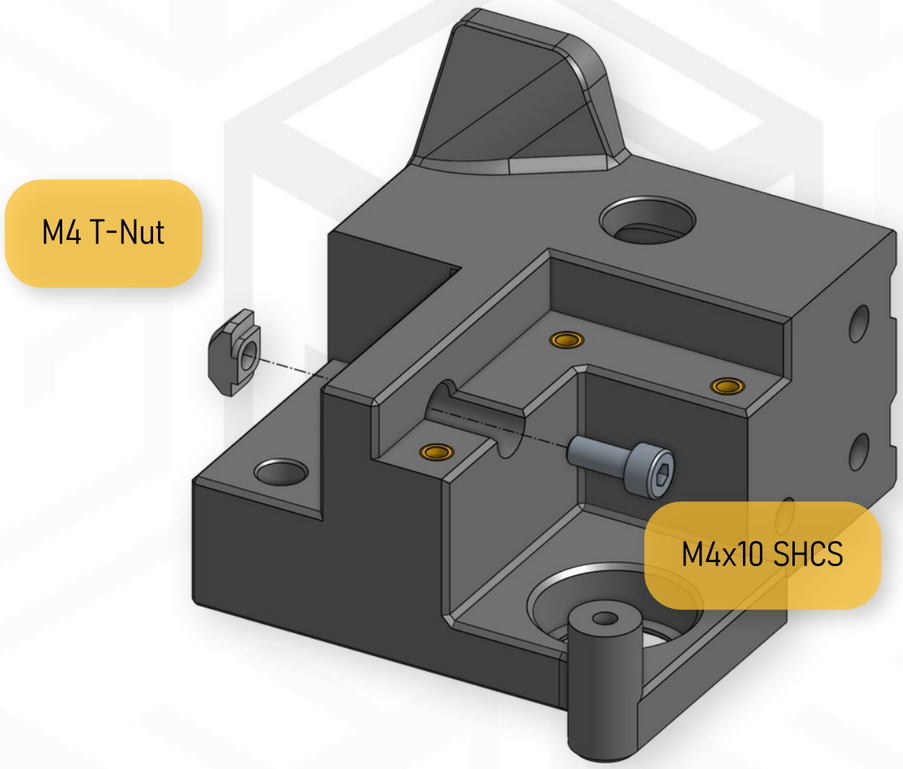
4x M3x10 SHCS (= both sides)
2x M4x10 SHCS (= both sides)

2x M4 T-Nut (= both sides)

PRINTED PARTS:

2x frame_bottom_front_rod_lock.stl (= both sides)





BOTTOM FRAME
FRONT CORNERS

Z AXIS LEADSCREWS – PULLEY INSTALLATION

TOOLS:

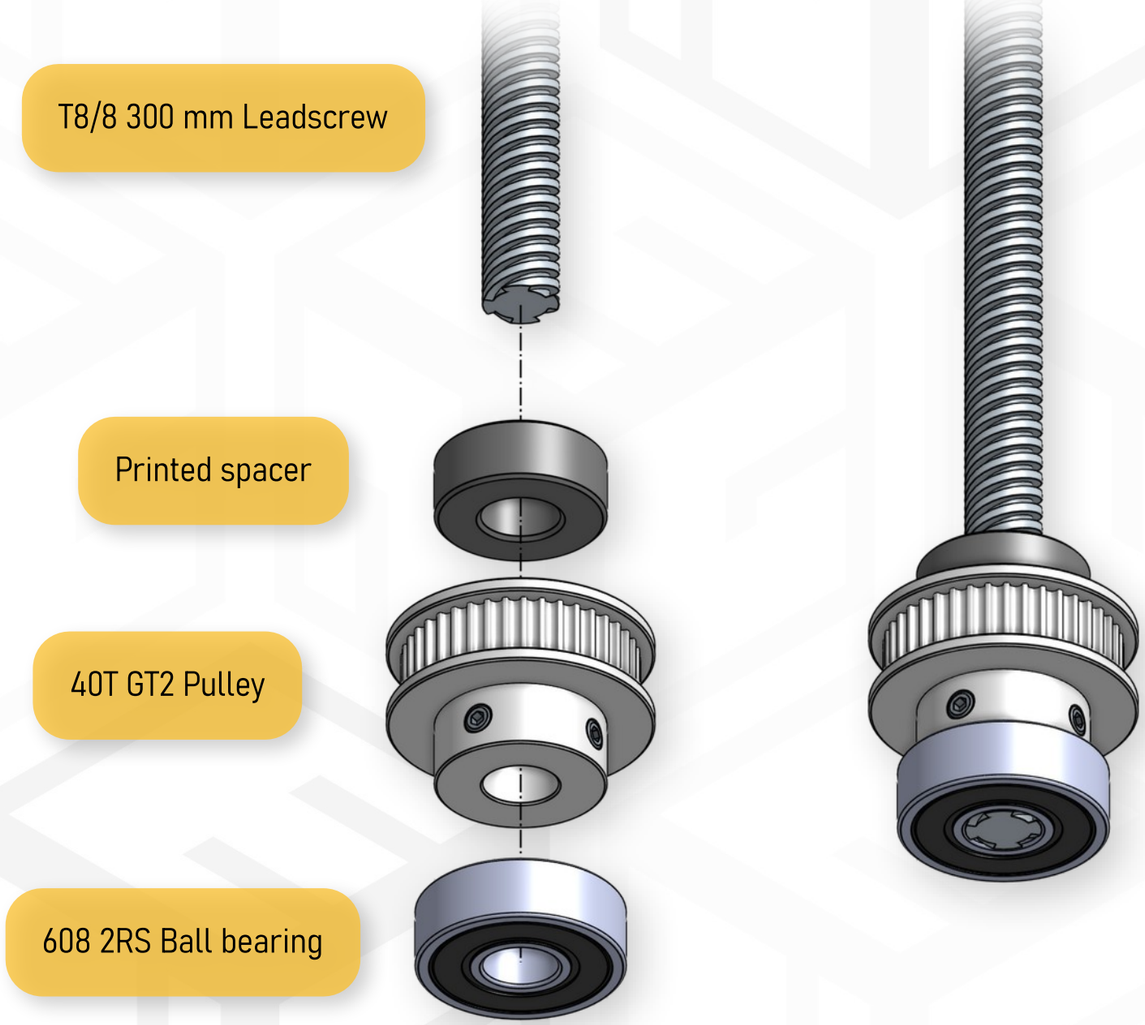
1.5 mm Allen key

HARDWARE:

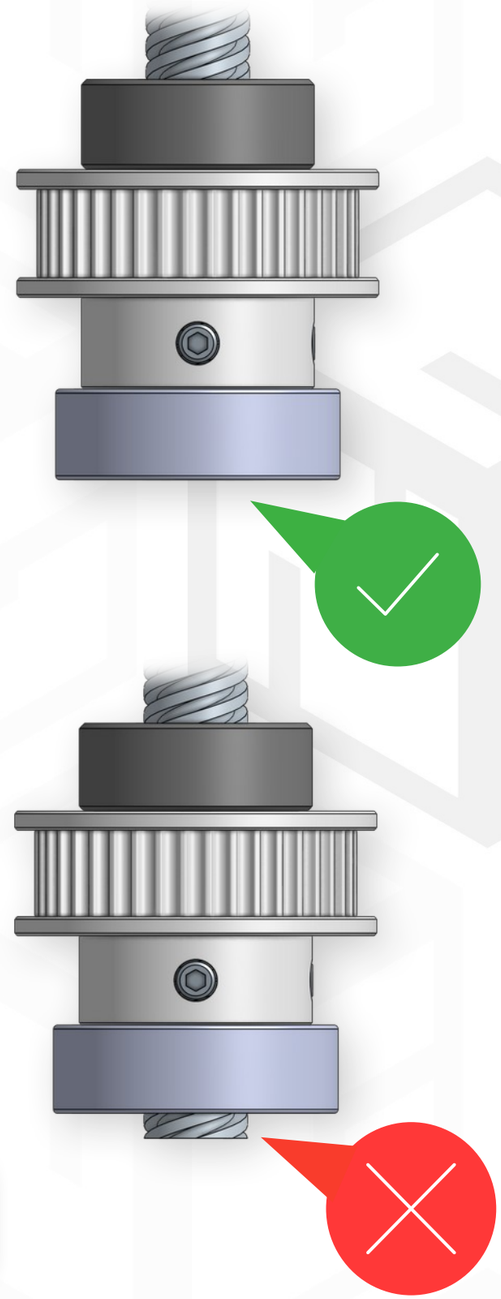
3x T8/8 x 300mm Leadscrew
3x GT2 40T 8mm Pulley
1x 608 2RS Ball bearing

PRINTED PARTS:

3x frame_bottom_pulley_spacer.stl



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



Remove the bottom bearing.

BOTTOM FRAME
FRONT CORNERS

LEADSCREW BEARINGS INSTALLATION

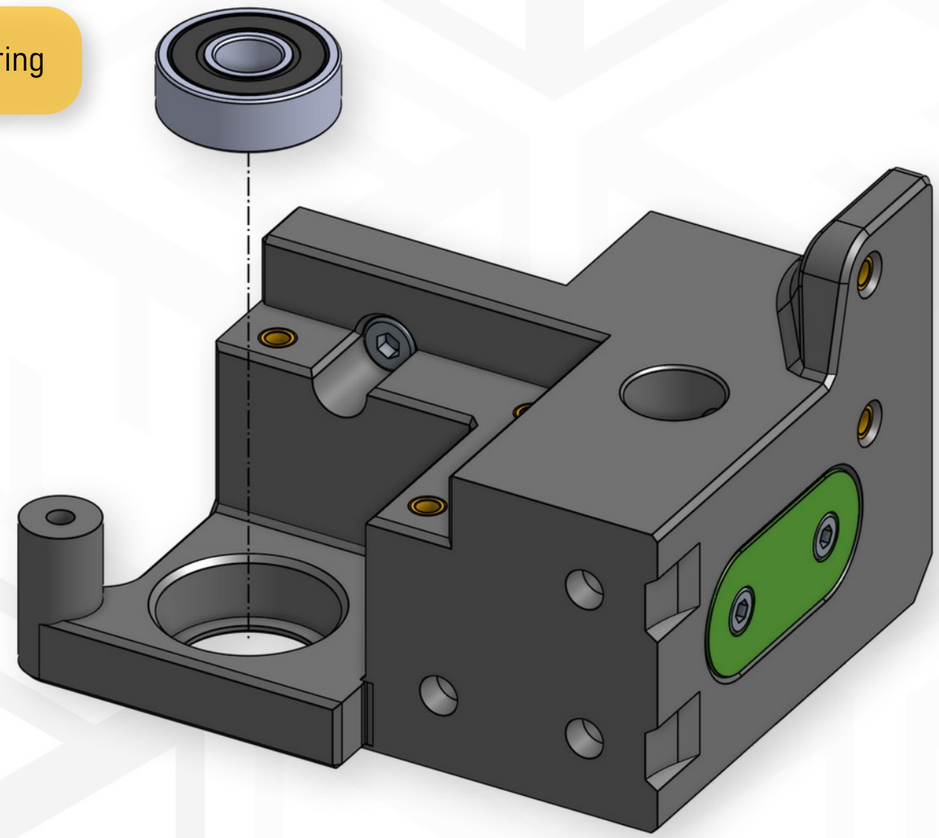
HARDWARE:

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

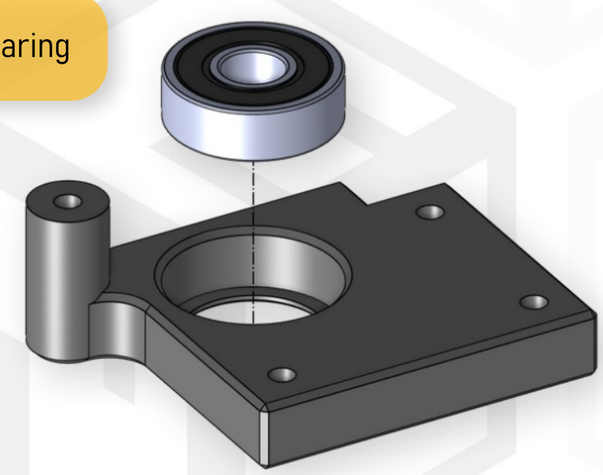
PRINTED PARTS:

frame_bottom_front_left_cap.stl (pictured in the build guide)
frame_bottom_front_right_cap.stl

608 2RS Ball bearing



608 2RS Ball bearing



BOTTOM FRAME
FRONT CORNERS

FRONT 2020 EXTRUSION INSTALLATION

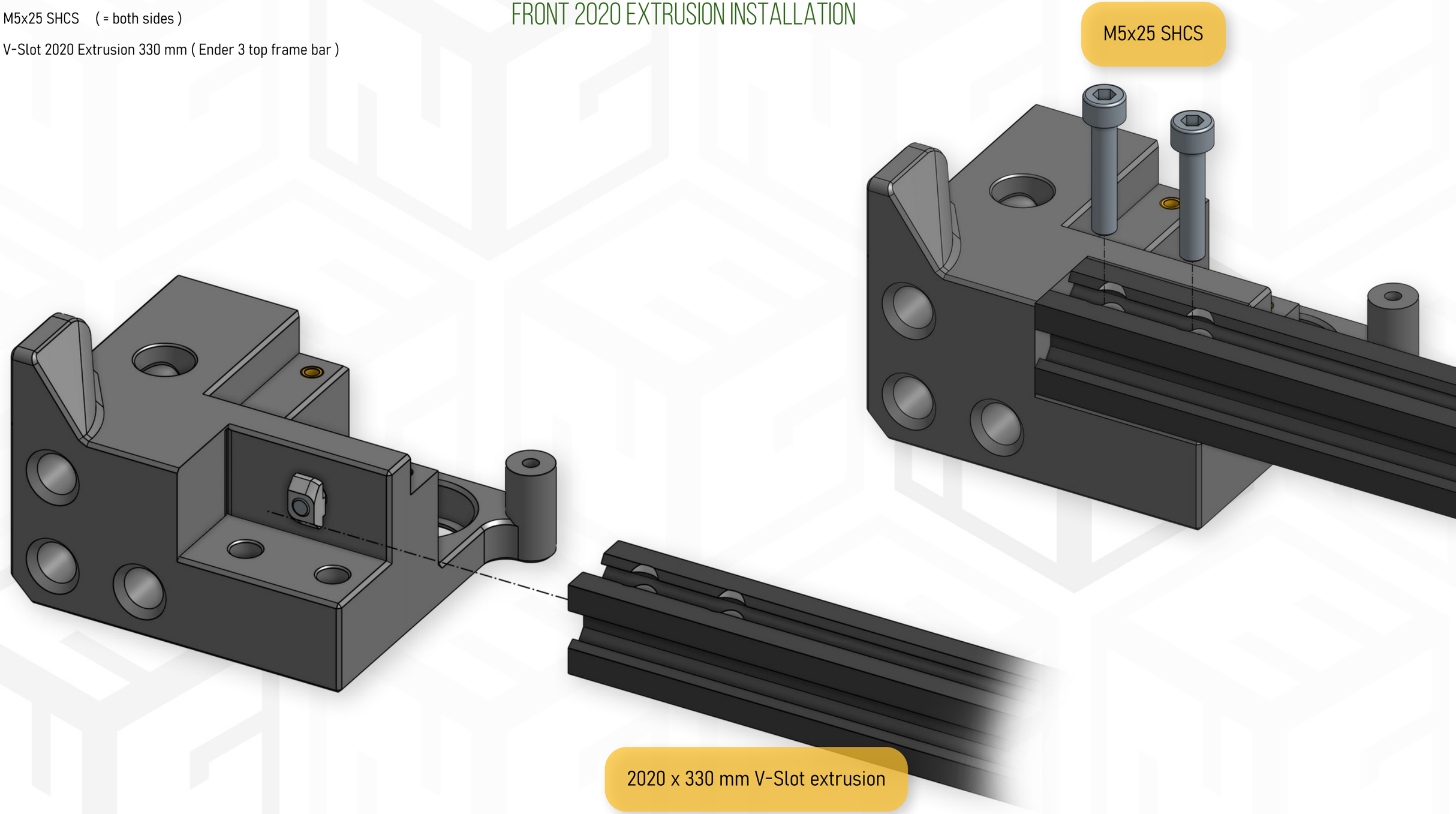
TOOLS:

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)

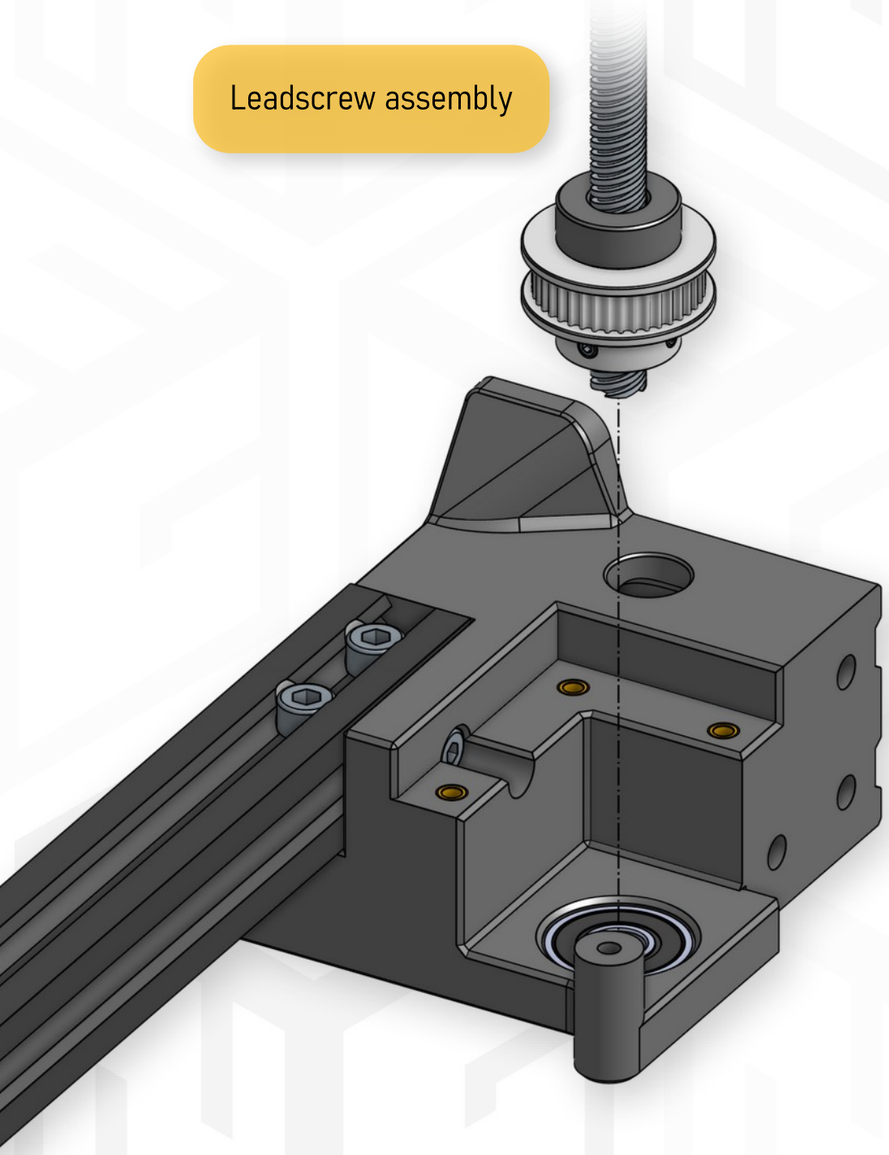


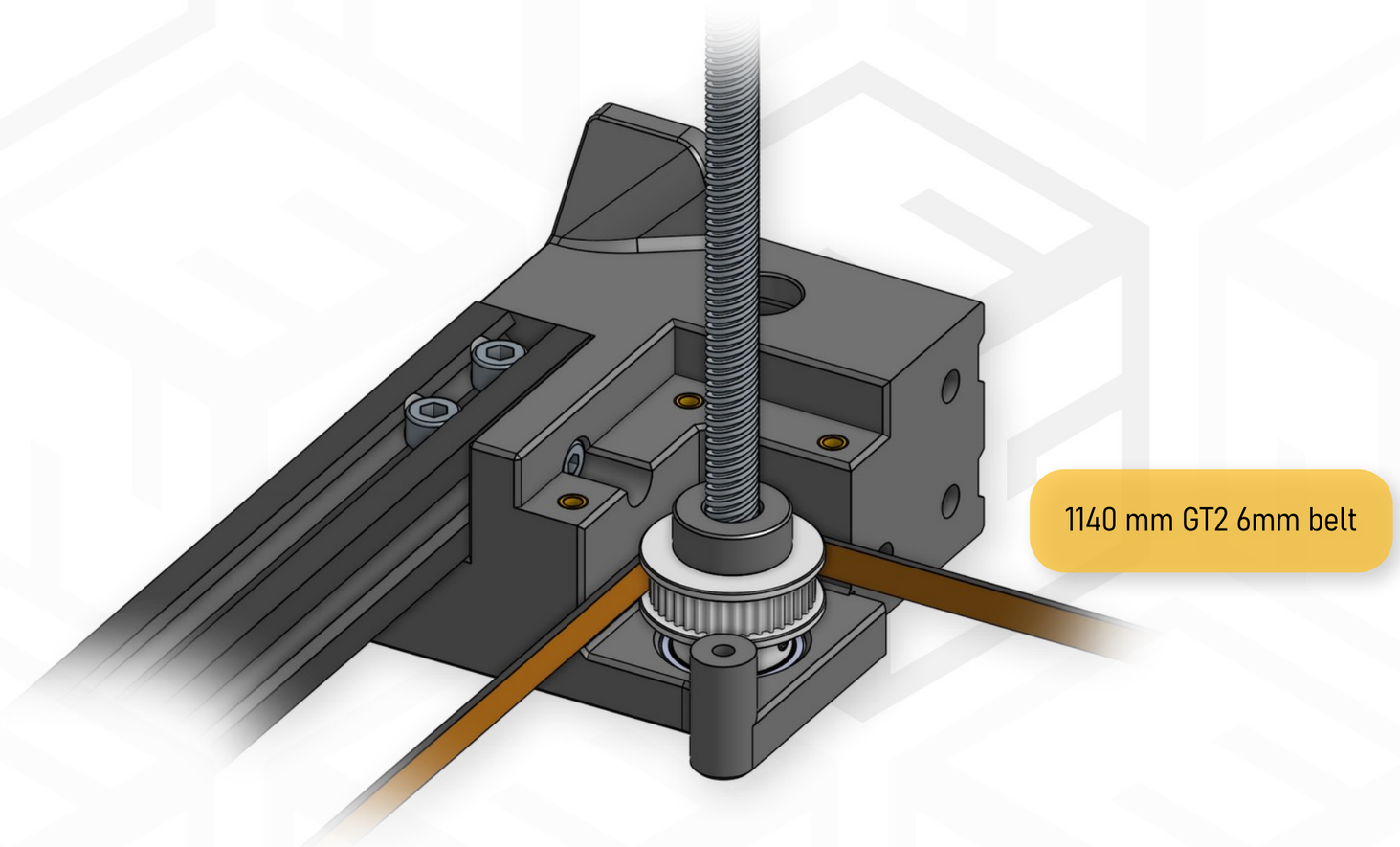
BOTTOM FRAME
FRONT CORNERS

LEADSCREWS AND BELT INSTALLATION

HARDWARE:

1x 1140 mm GT2 6mm closed loop belt (1x Z stepper motor version)





BOTTOM FRAME
FRONT CORNERS
LEADSCREW CAPS

TOOLS:

2.5 mm Allen key

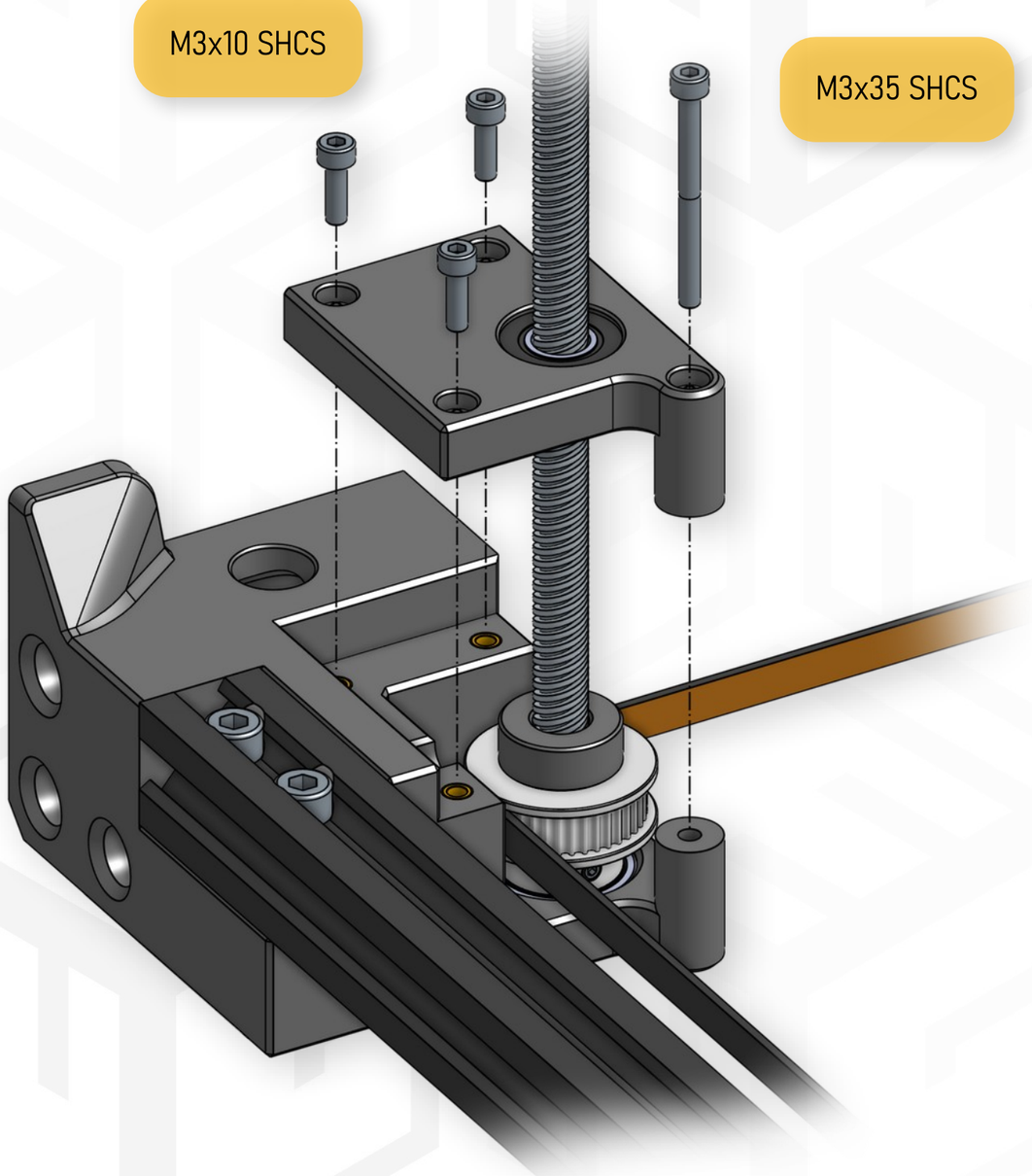
HARDWARE:

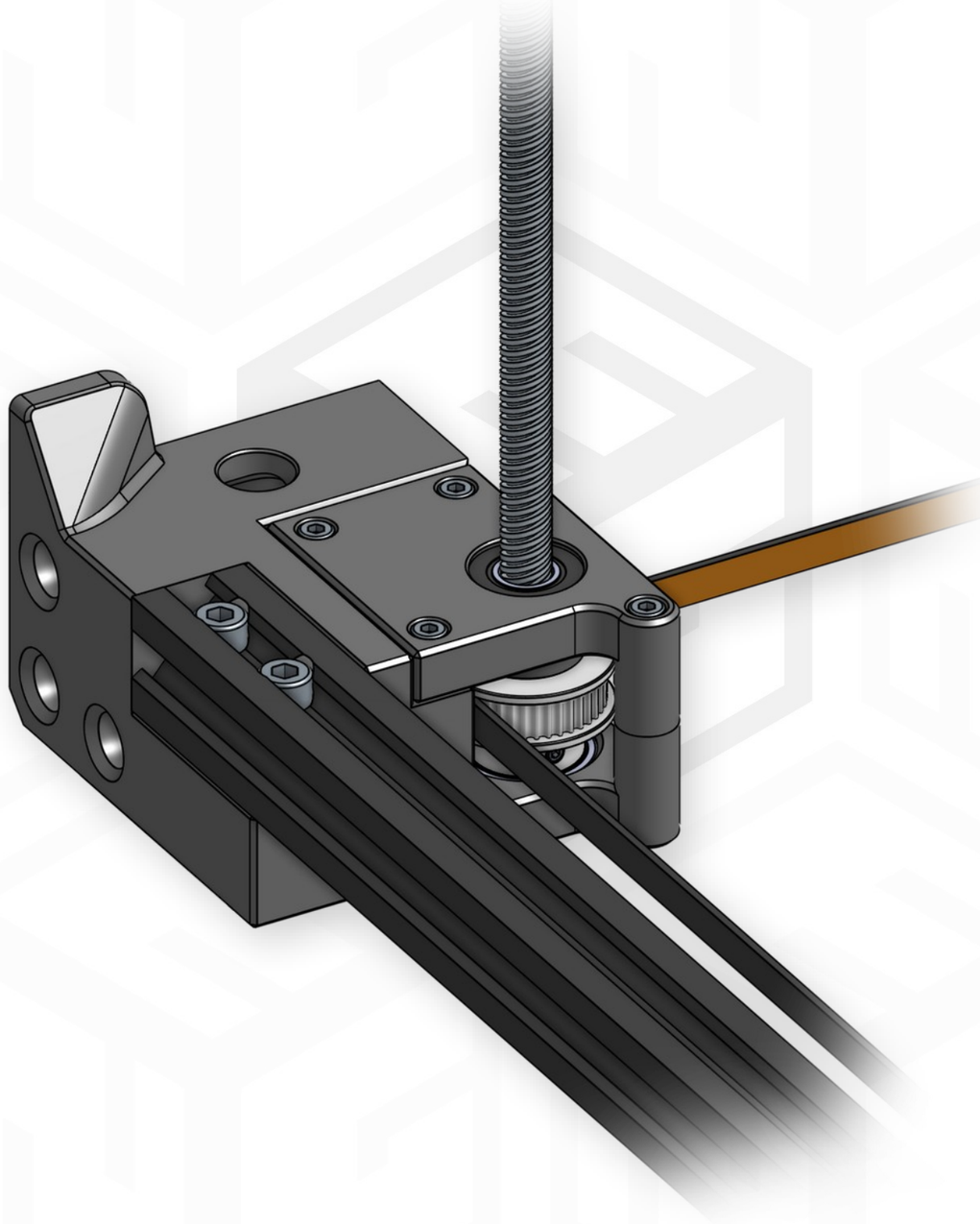
6x M3x10 SHCS (= both sides)
2x M3x35 SHCS (= both sides)

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

M3x10 SHCS

M3x35 SHCS





BOTTOM FRAME
FRONT CORNERS

MAKE SURE YOU DO NOT FORGET THE RIGHT SIDE

BOTTOM FRAME
FRONT SKIRT

INSTALLING HEAT SET INSERTS

TOOLS:

Heat set insert press

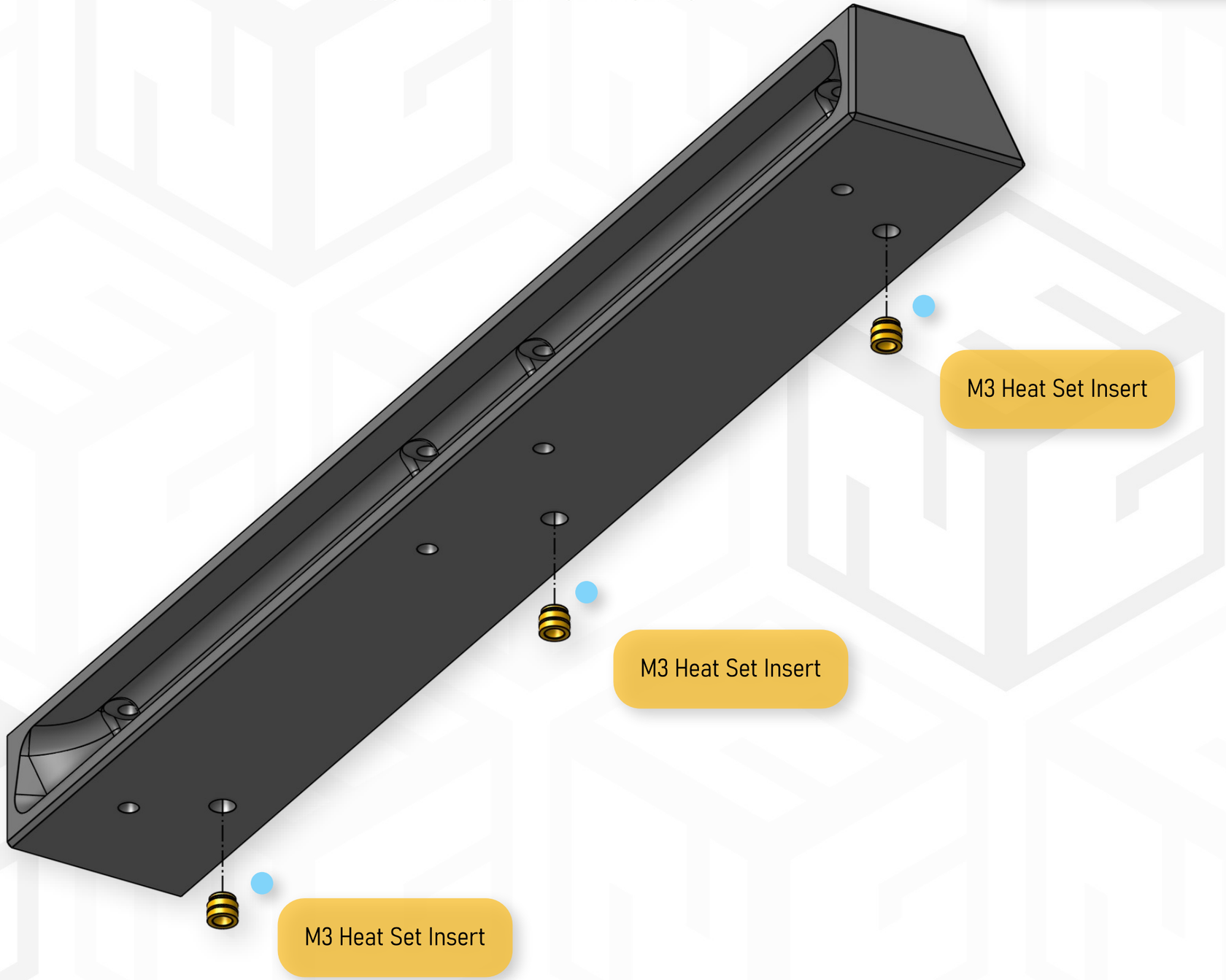
HARDWARE:

3x M3 Heat set insert

PRINTED PARTS:

frame_bottom_front_skirt.stl

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.



BOTTOM FRAME
FRONT SKIRT
INSTALLING SCREWS AND T-NUTS

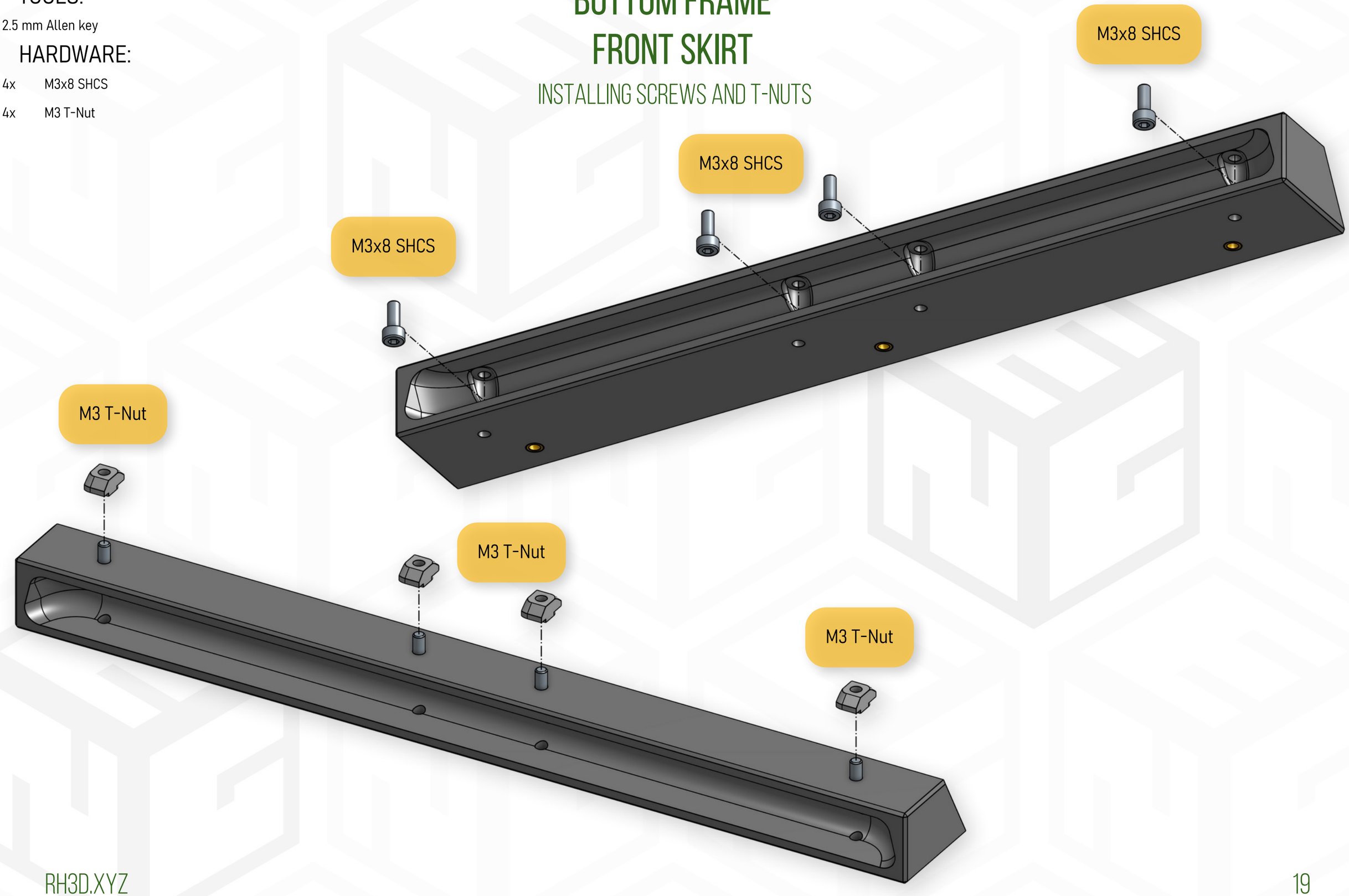
TOOLS:

2.5 mm Allen key

HARDWARE:

4x M3x8 SHCS

4x M3 T-Nut

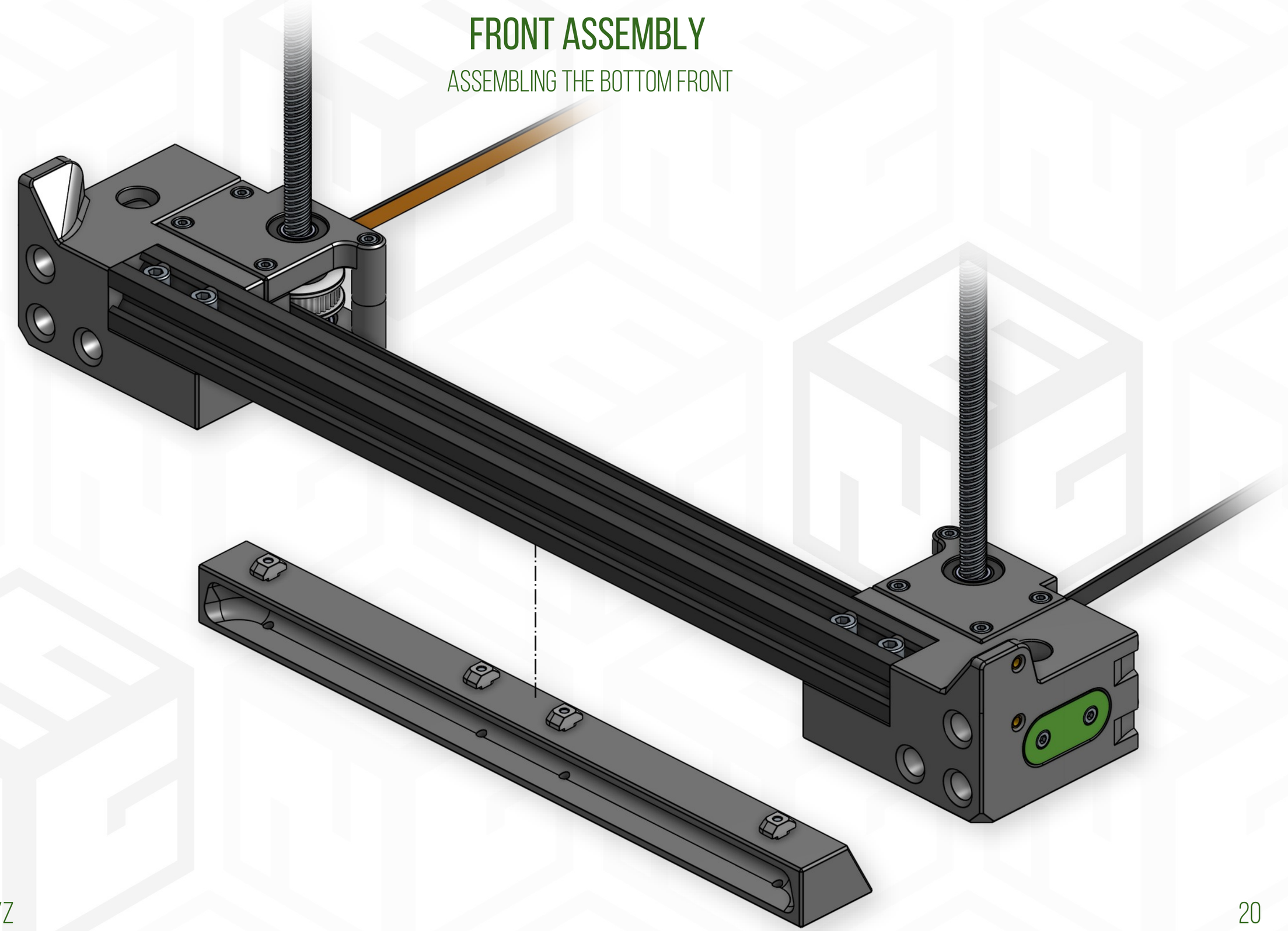


TOOLS:

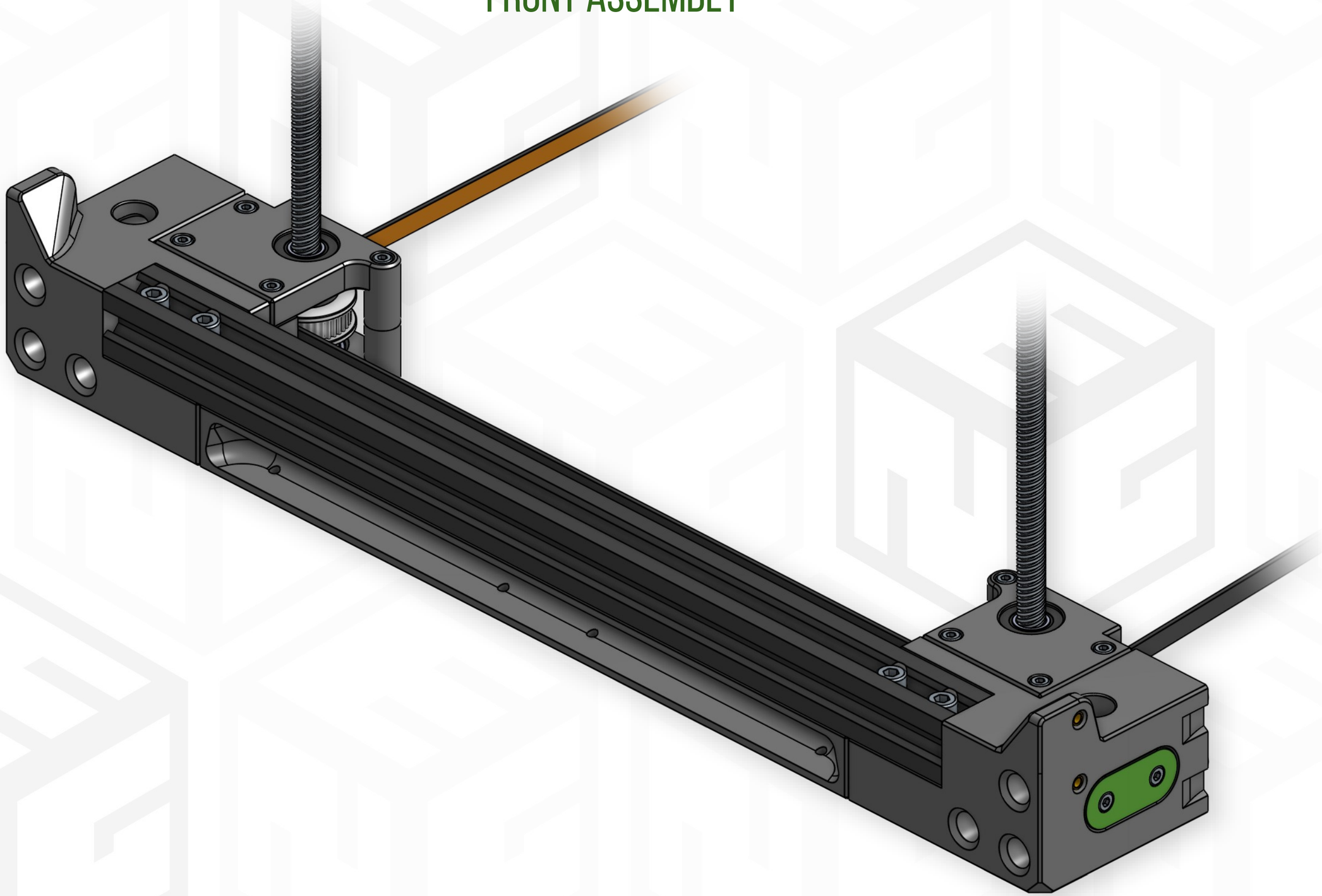
2.5 mm Allen key

BOTTOM FRAME
FRONT ASSEMBLY

ASSEMBLING THE BOTTOM FRONT



BOTTOM FRAME
FRONT ASSEMBLY



BASE PRINTER: ENDER 3

BOTTOM FRAME
REAR EXTRUSION

ENDER 3

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

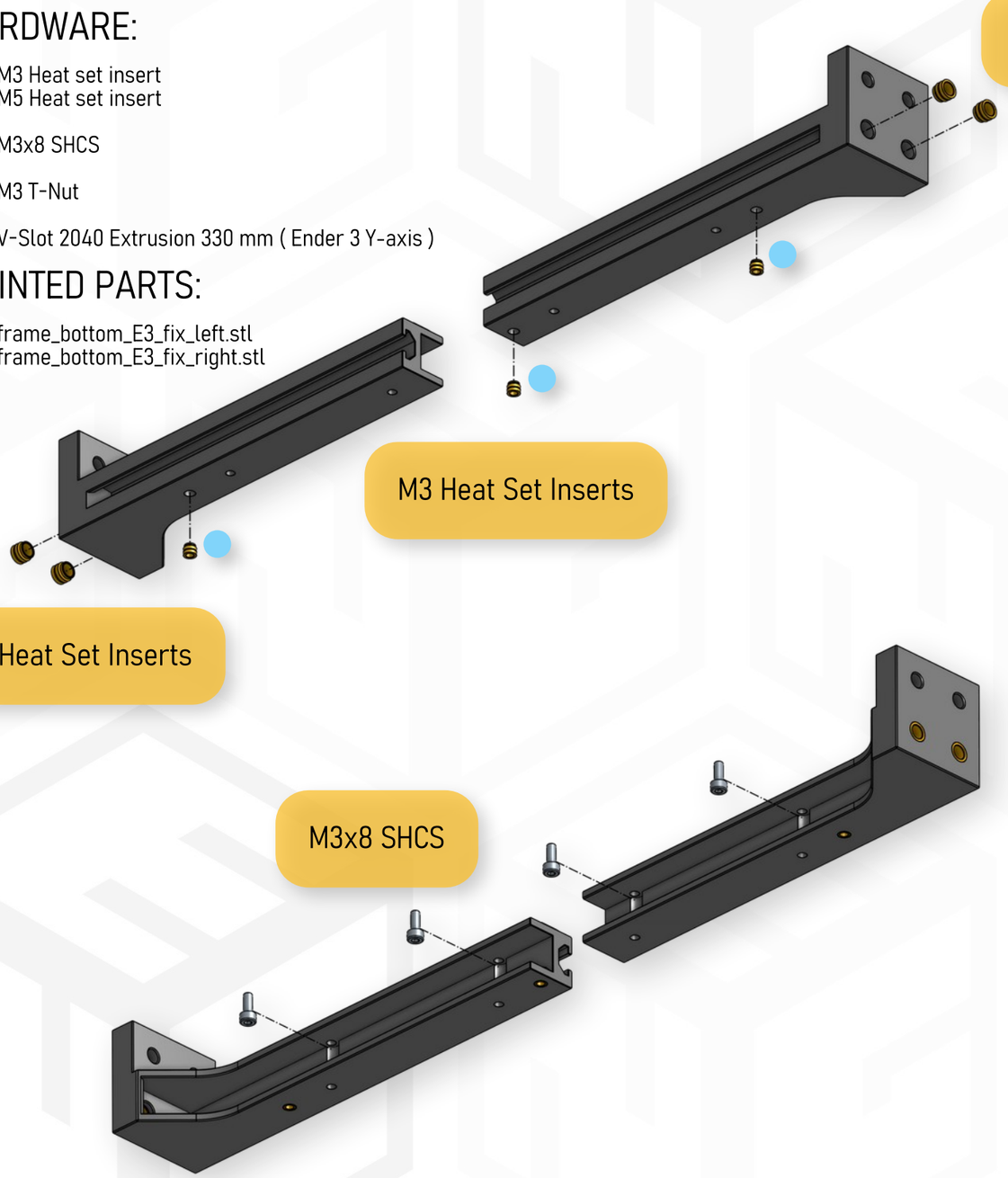
4x M3 T-Nut

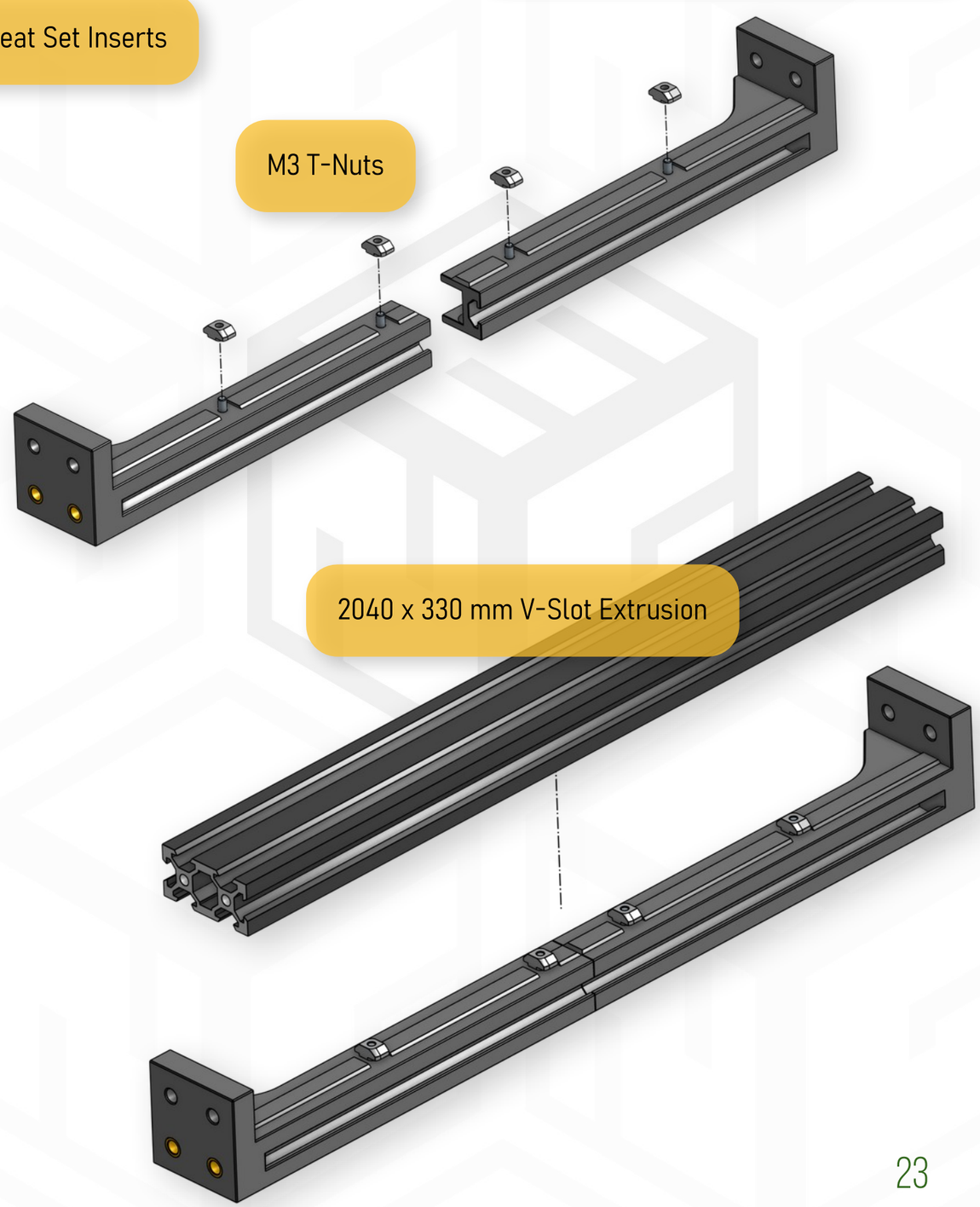
1x V-Slot 2040 Extrusion 330 mm (Ender 3 Y-axis)

PRINTED PARTS:

frame_bottom_E3_fix_left.stl
frame_bottom_E3_fix_right.stl

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.





BOTTOM FRAME
REAR EXTRUSION

ENDER 3 V2

BASE PRINTER: 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

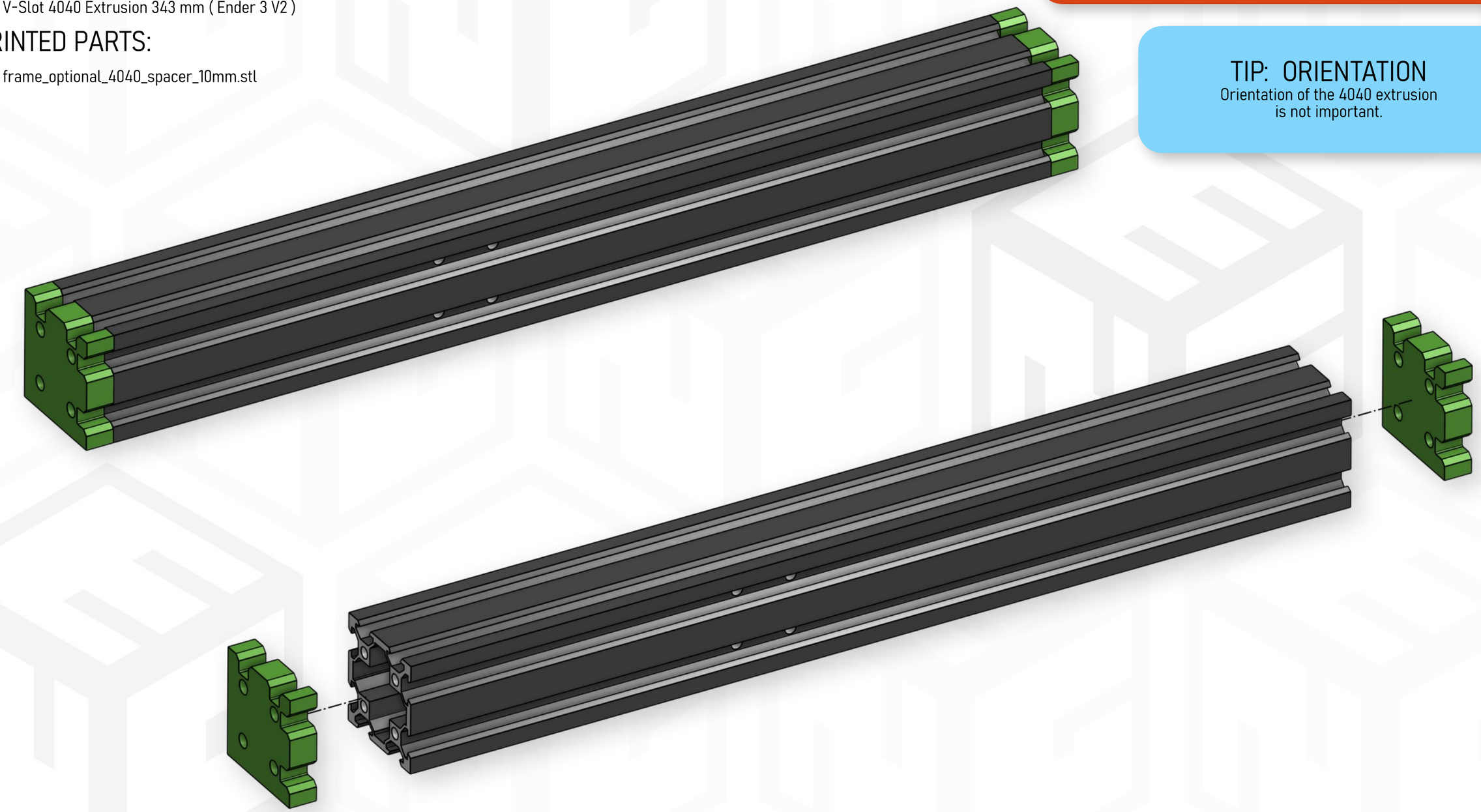
We need to adapt the length of our 4040 extrusion to be 350mm. Measure the length of your extrusion (Le) and based on that, adjust the 4040 spacers Z dimension (Zs) accordingly in the slicer.

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.



BOTTOM FRAME
REAR EXTRUSION
PREPARATION

TOOLS:

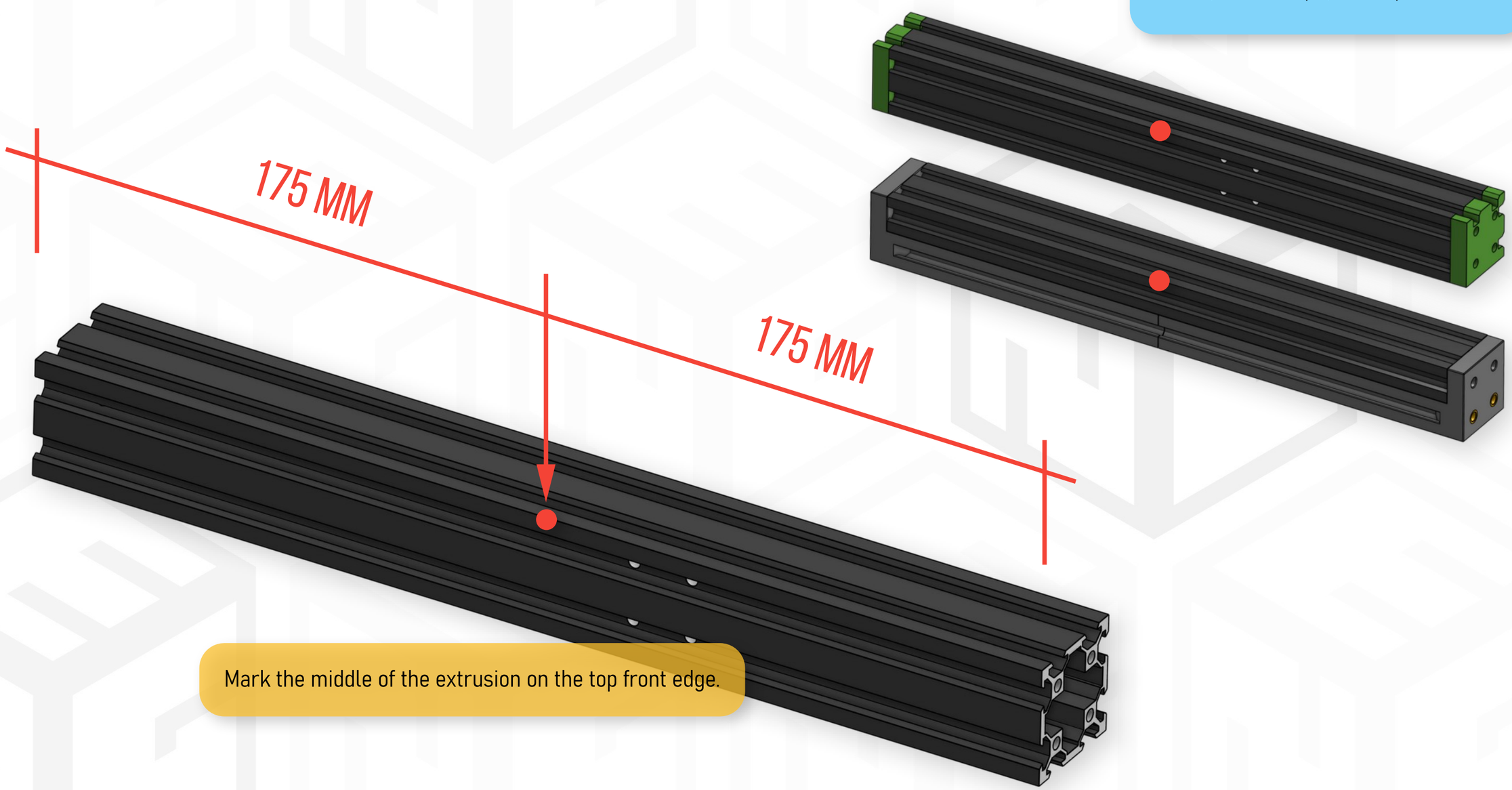
Tape measure / ruler
Marker (masking tape to keep the extrusion clean)

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

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

TIP: ORIENTATION
Orientation of the 4040 x 350mm extrusion (from Ender 3 pro) is not important.



Mark the middle of the extrusion on the top front edge.

BOTTOM FRAME
REAR

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.

Keep orientation of the side 4040 extrusions so the blind joint holes will be at the front and also in the outer V-Slot.

NOTE: SYMMETRY

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

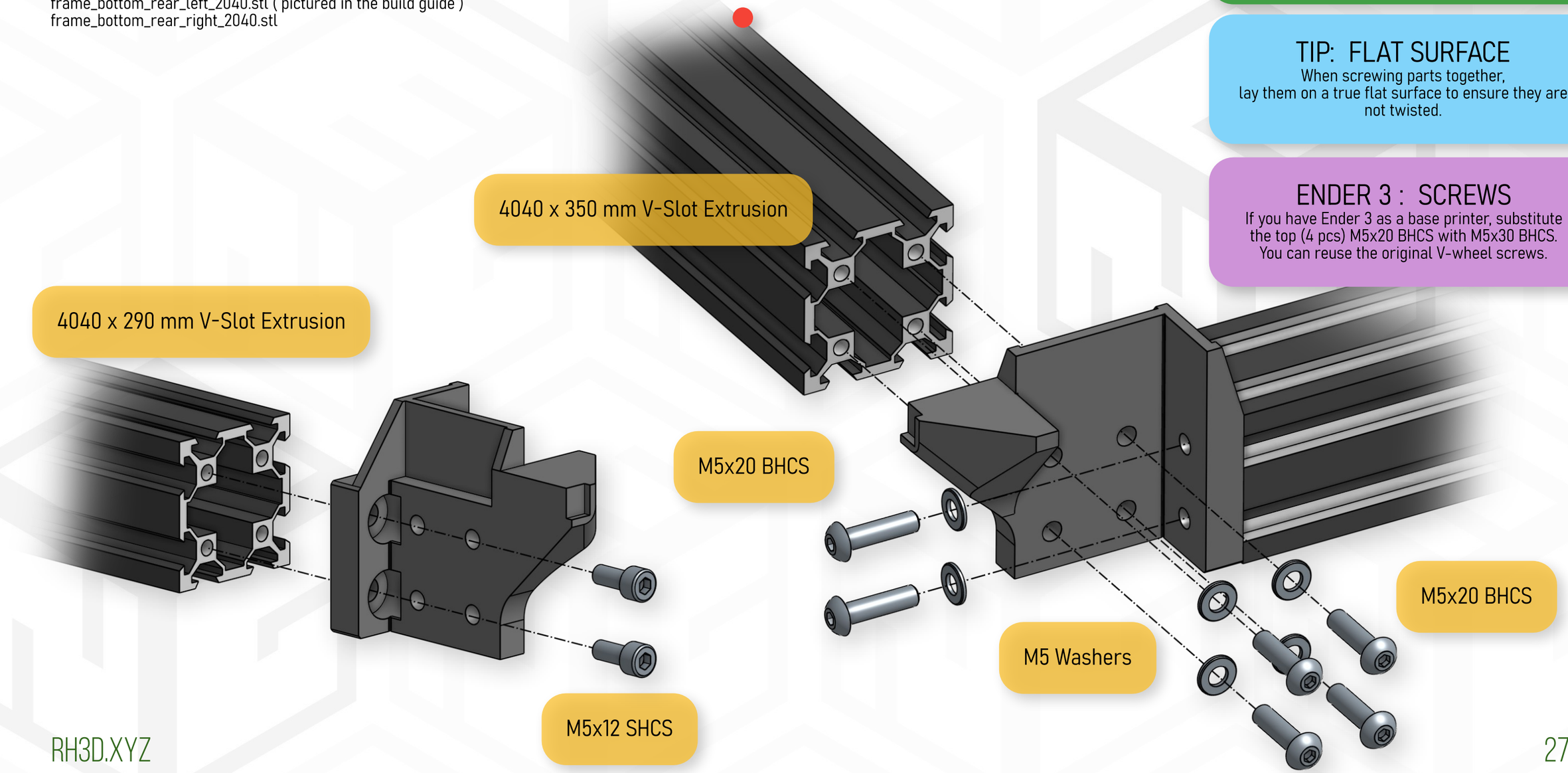
Repeat this process for the other side.

TIP: FLAT SURFACE

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

ENDER 3 : SCREWS

If you have Ender 3 as a base printer, substitute the top (4 pcs) M5x20 BHCS with M5x30 BHCS. You can reuse the original V-wheel screws.



BOTTOM FRAME SIDES

TOOLS:

3 mm Allen key

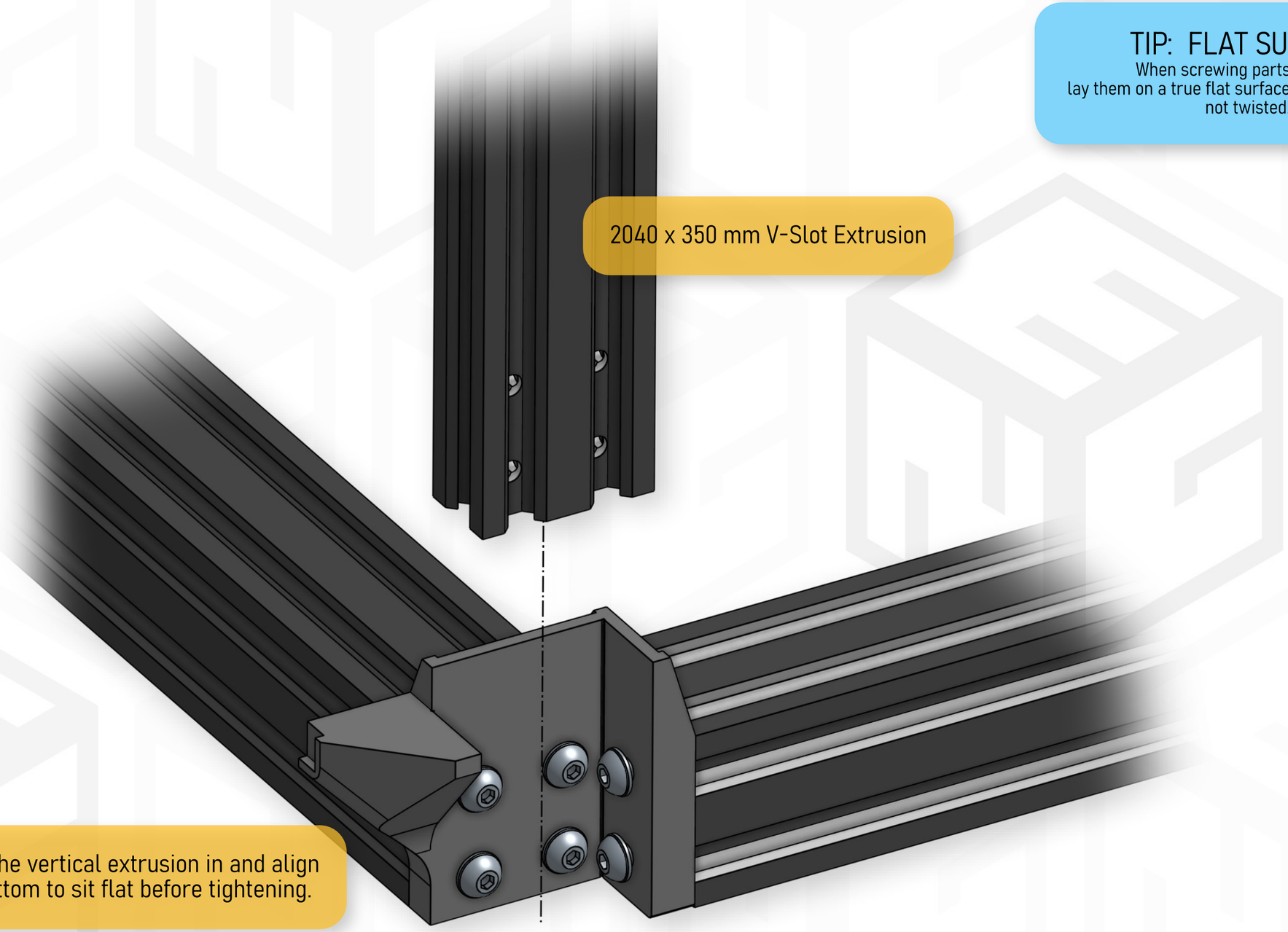
HARDWARE:

2x V-Slot 2040 Extrusion 350 mm (= both 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 a true flat surface to ensure they are not twisted.



BOTTOM FRAME SIDES

ULTIMATE FRAME - FRONT SUPPORTS

TOOLS:

3 mm Allen key

HARDWARE:

4x M5x20 BHCS (= both sides)

4x M5 Washer (= both sides)

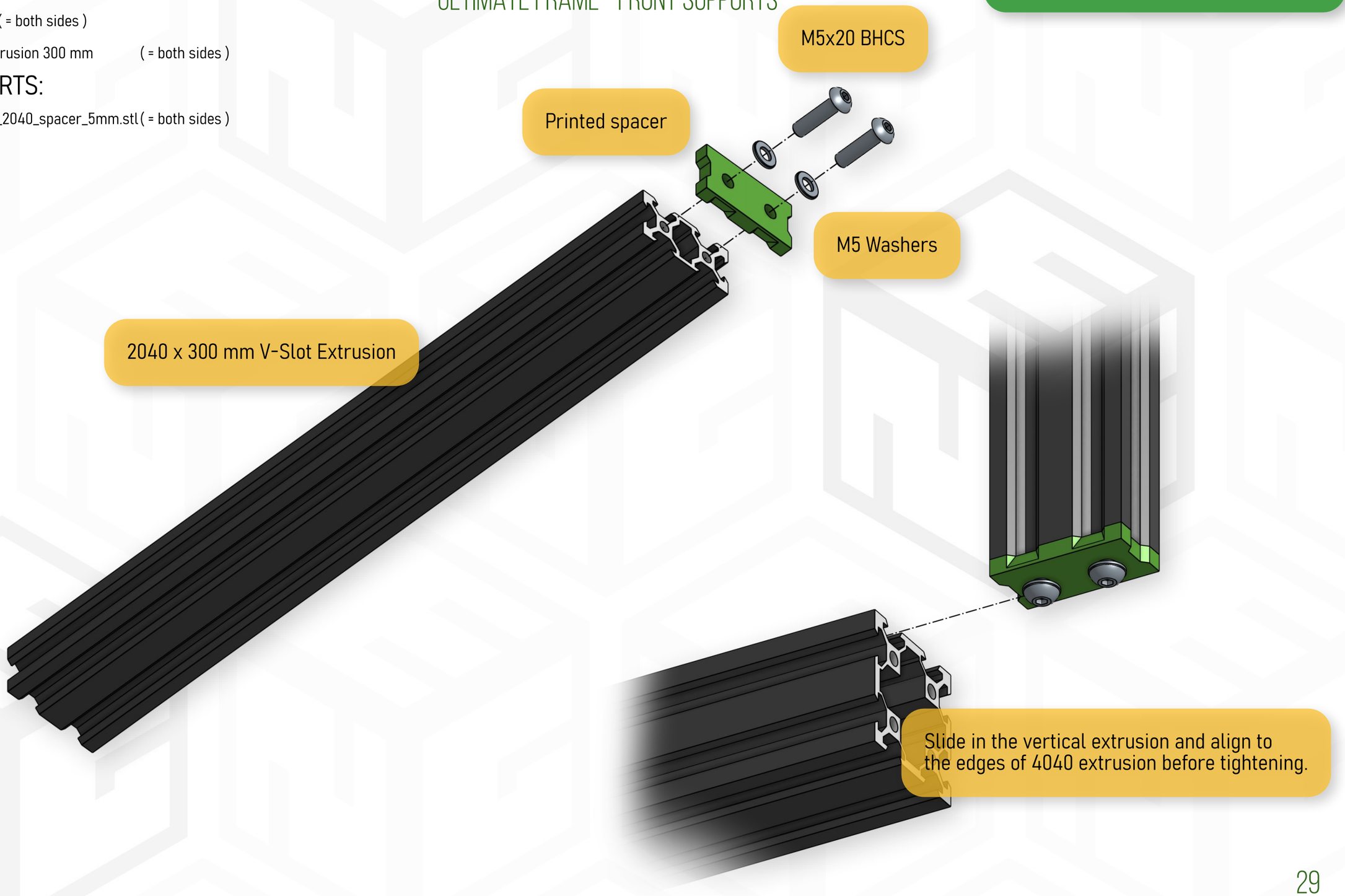
2x V-Slot 2040 Extrusion 300 mm (= both sides)

PRINTED PARTS:

2x frame_optional_2040_spacer_5mm.stl (= both sides)

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

Repeat this process for the other side.



BOTTOM FRAME ASSEMBLY

BOTTOM FRAME
FRONT

TOOLS:

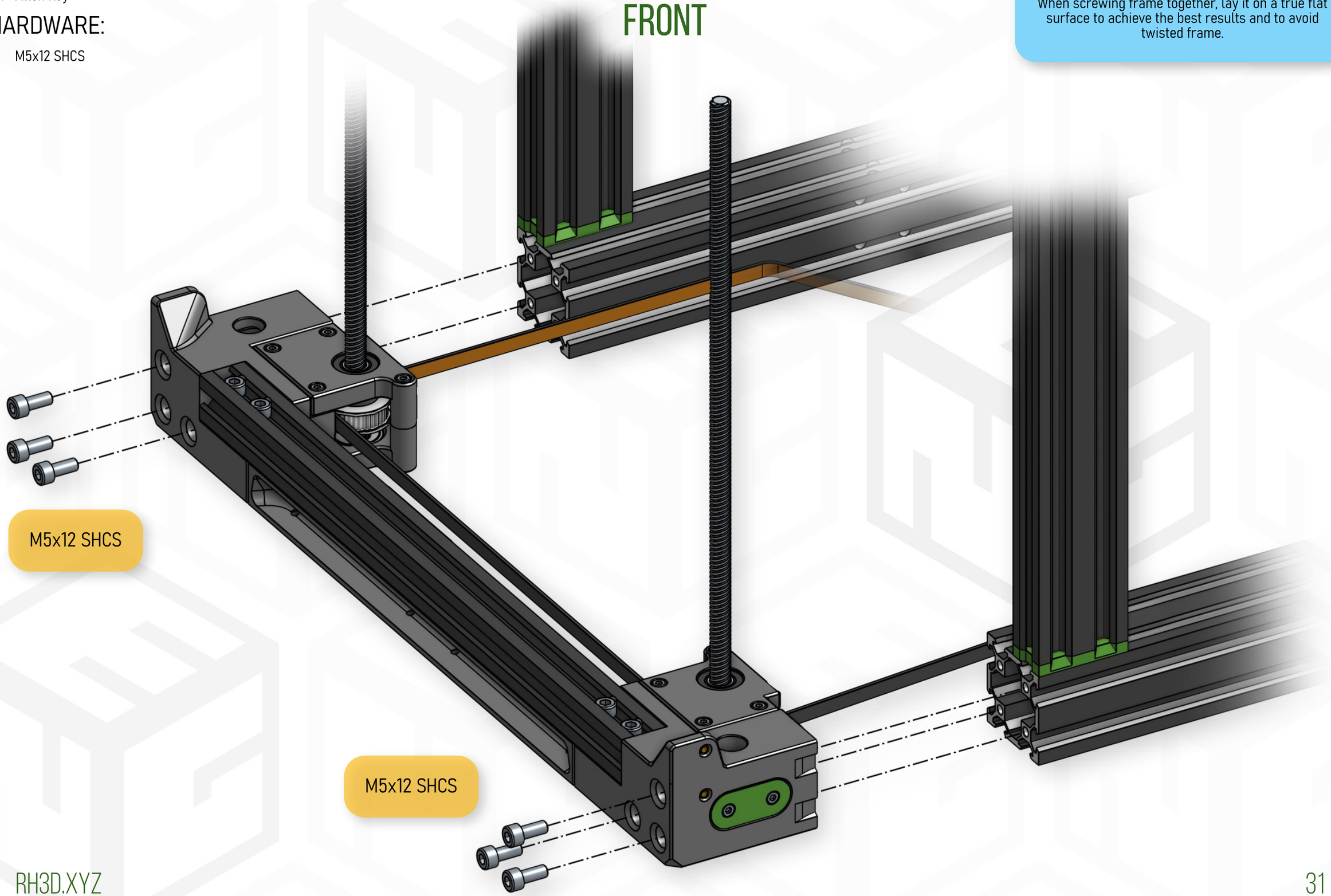
4 mm Allen key

HARDWARE:

6x M5x12 SHCS

TIP: FLAT SURFACE

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



BOTTOM FRAME SIDES

RUBBER FEET

TOOLS:

4 mm Allen key

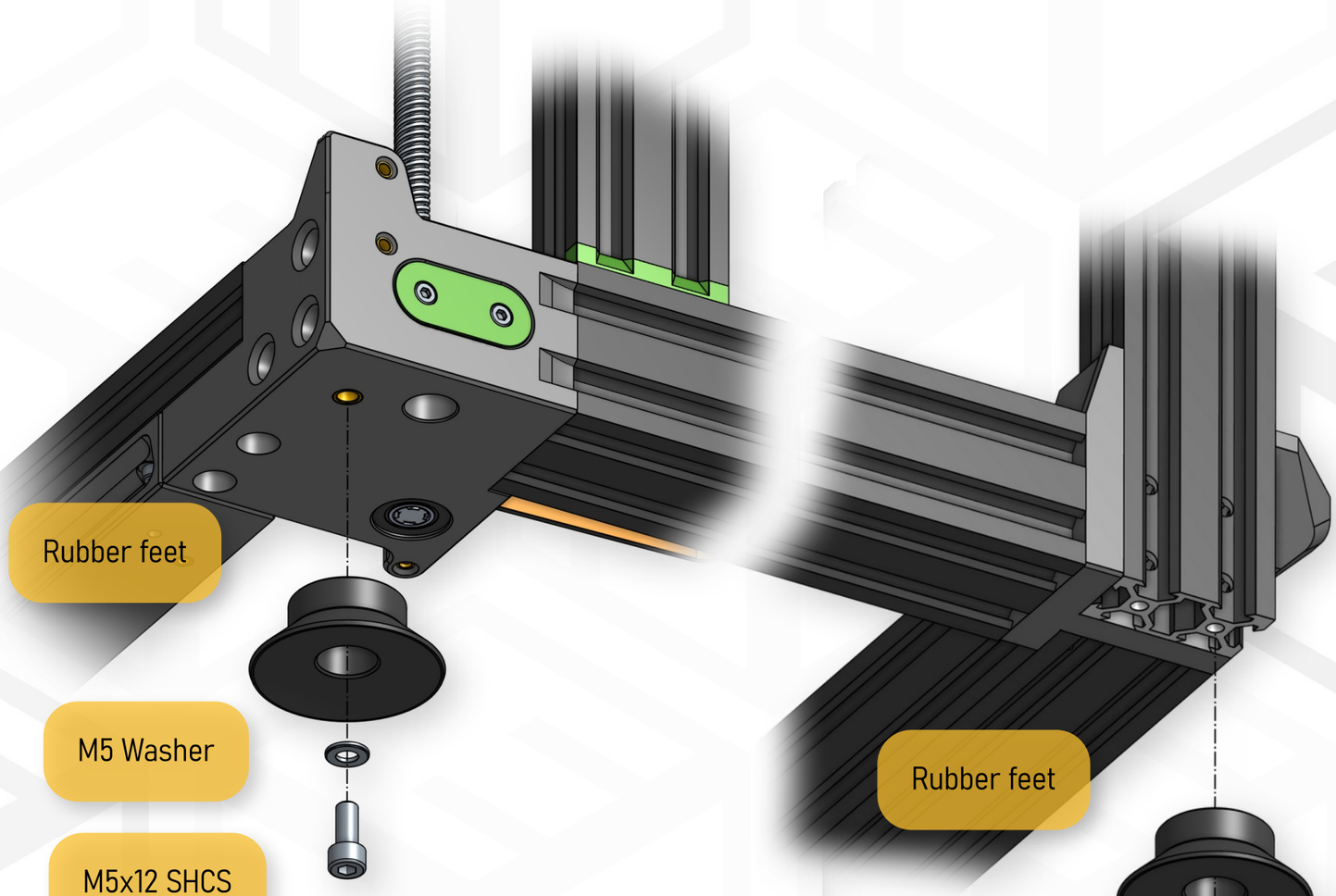
HARDWARE:

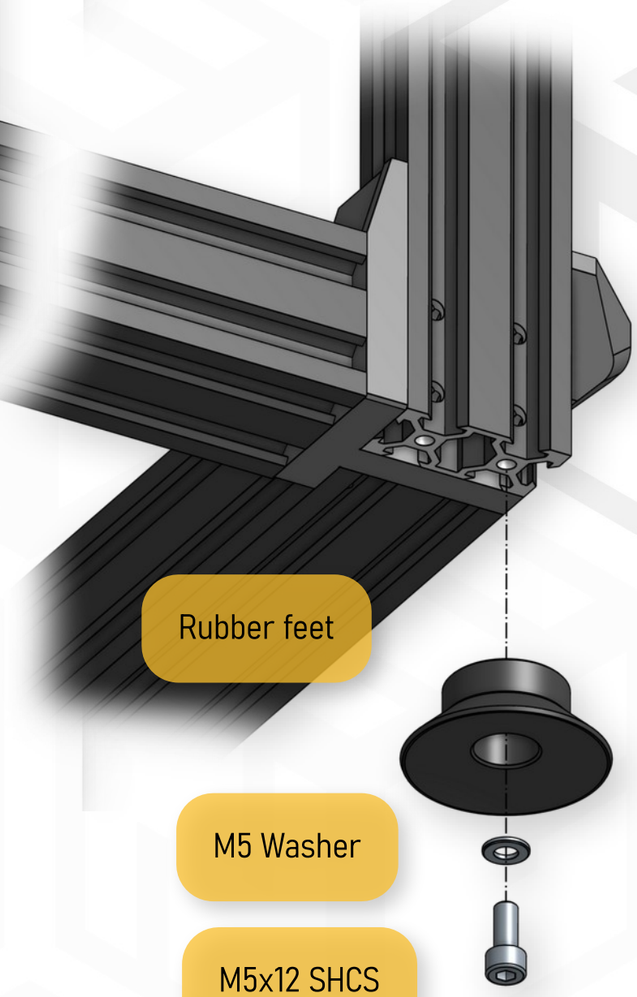
4x M5x12 SHCS (= both sides)
4x M5 Washer (= both sides)

4x Rubber feet (= both sides)

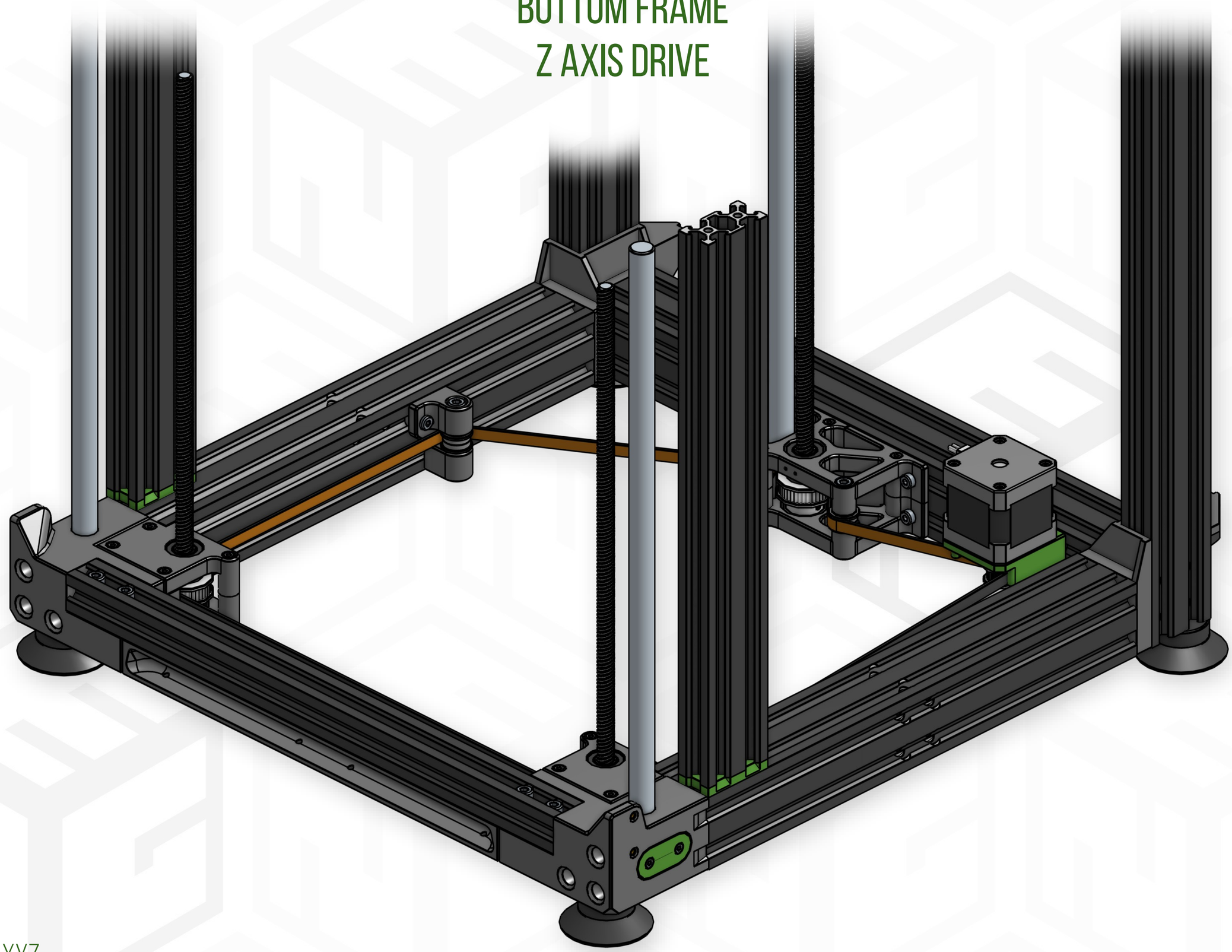
NOTE: SYMMETRY
Left and right sides are symmetrical, therefore only one is shown here.

Repeat this process for the other side.

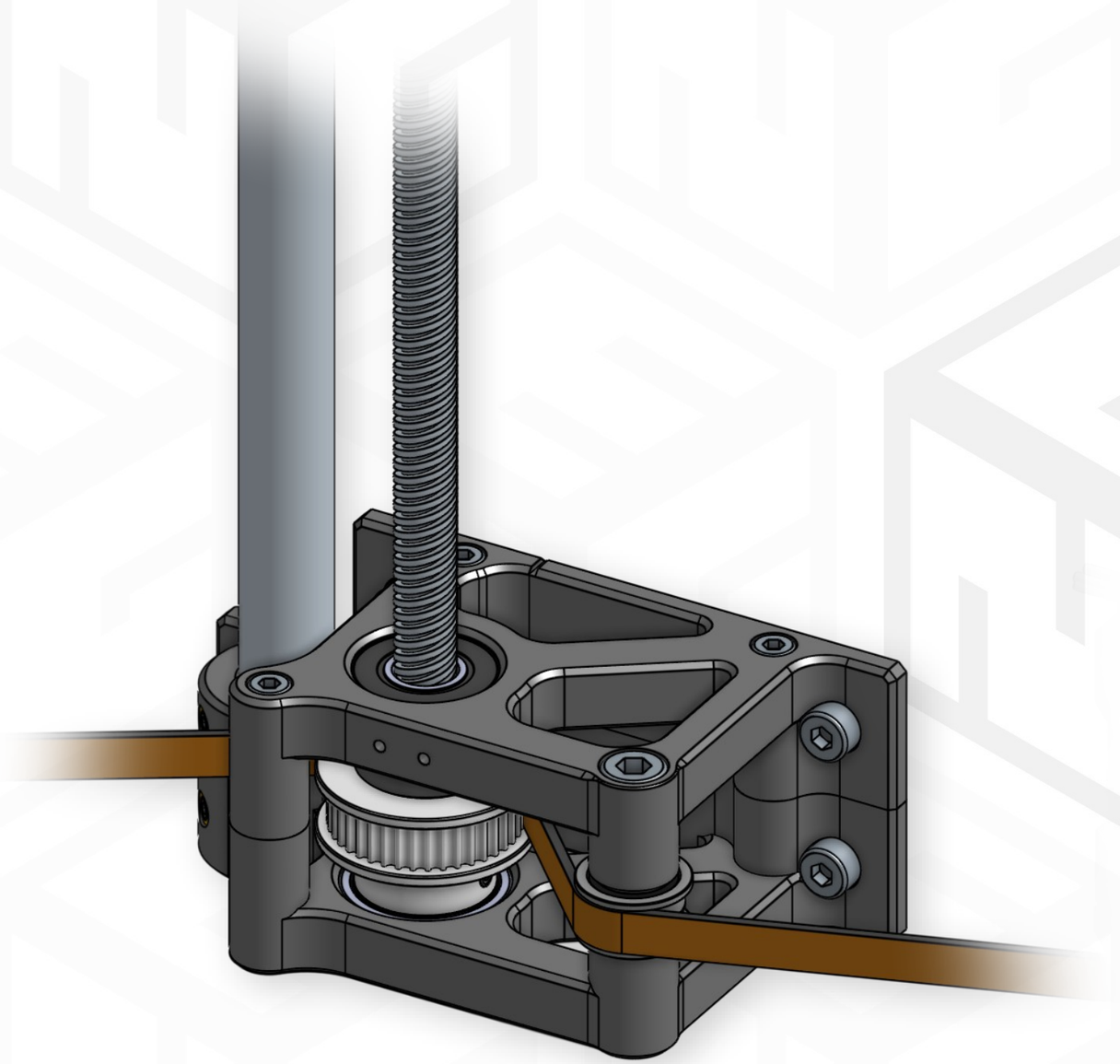




BOTTOM FRAME
Z AXIS DRIVE



BOTTOM FRAME
REAR Z SUPPORT



BOTTOM FRAME
REAR Z SUPPORT

HEAT SET INSERTS AND BALL BEARINGS INSTALLATION

TOOLS:

Heat set insert press

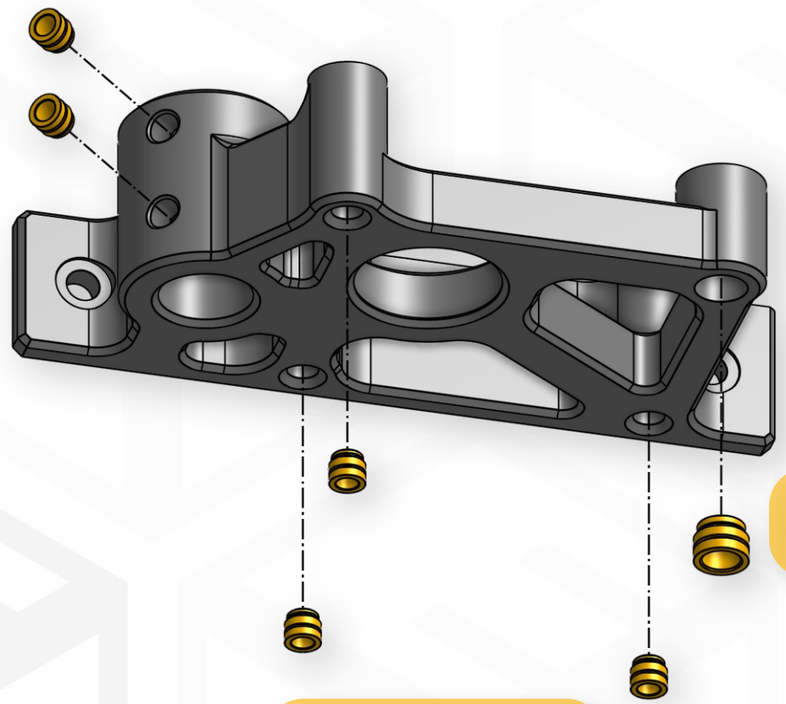
HARDWARE:

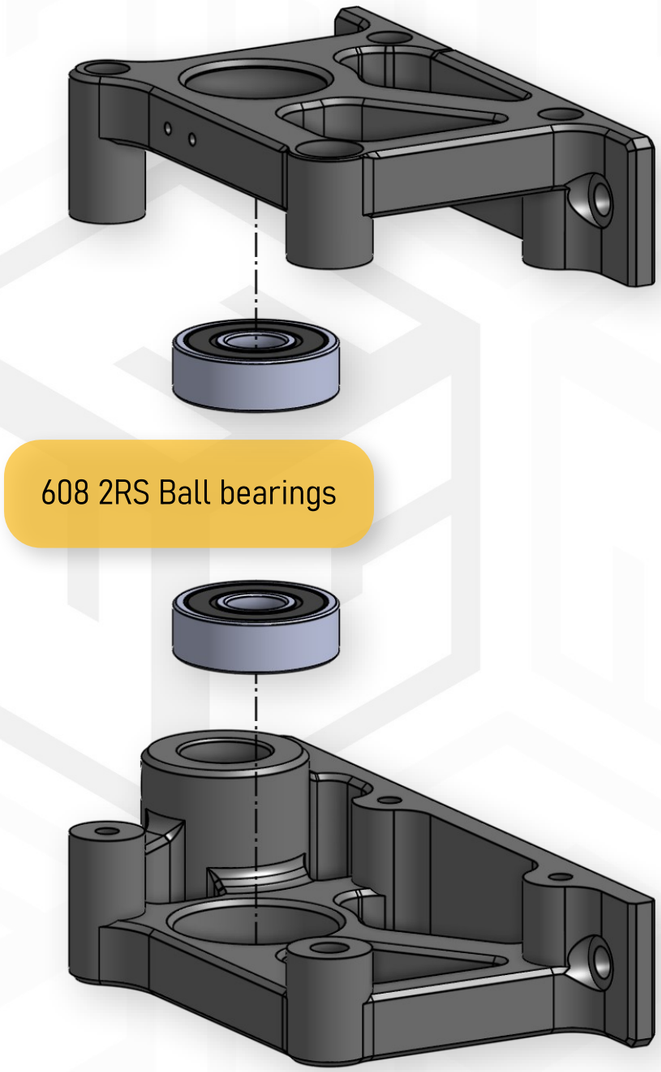
5x M3 Heat set insert
1x M5 Heat set insert

2x 608 2RS Ball bearing

PRINTED PARTS:

frame_bottom_rear_Z_lower_triple.stl
frame_bottom_rear_Z_upper_1140mm.stl





BOTTOM FRAME
REAR Z SUPPORT

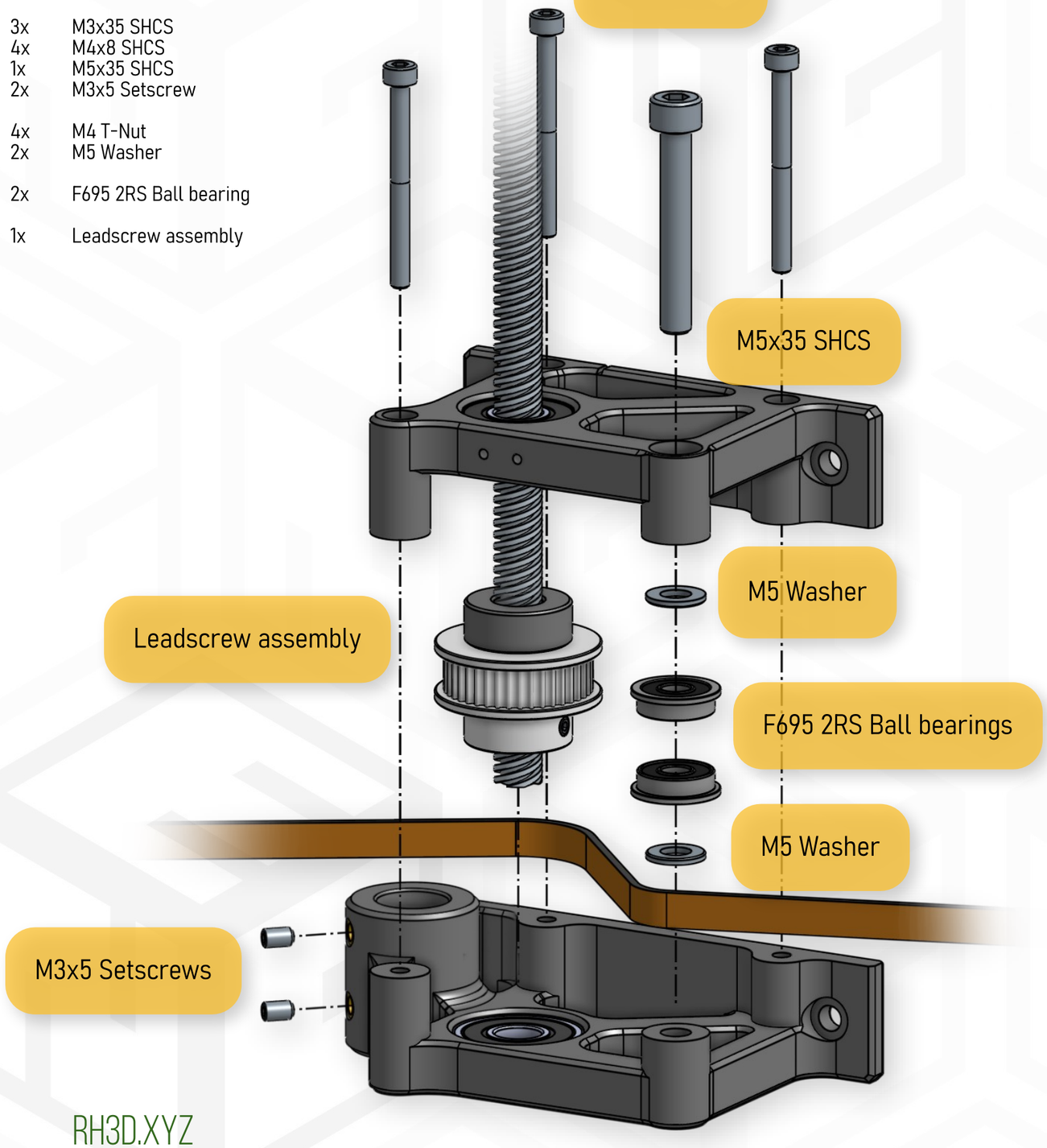
ASSEMBLY

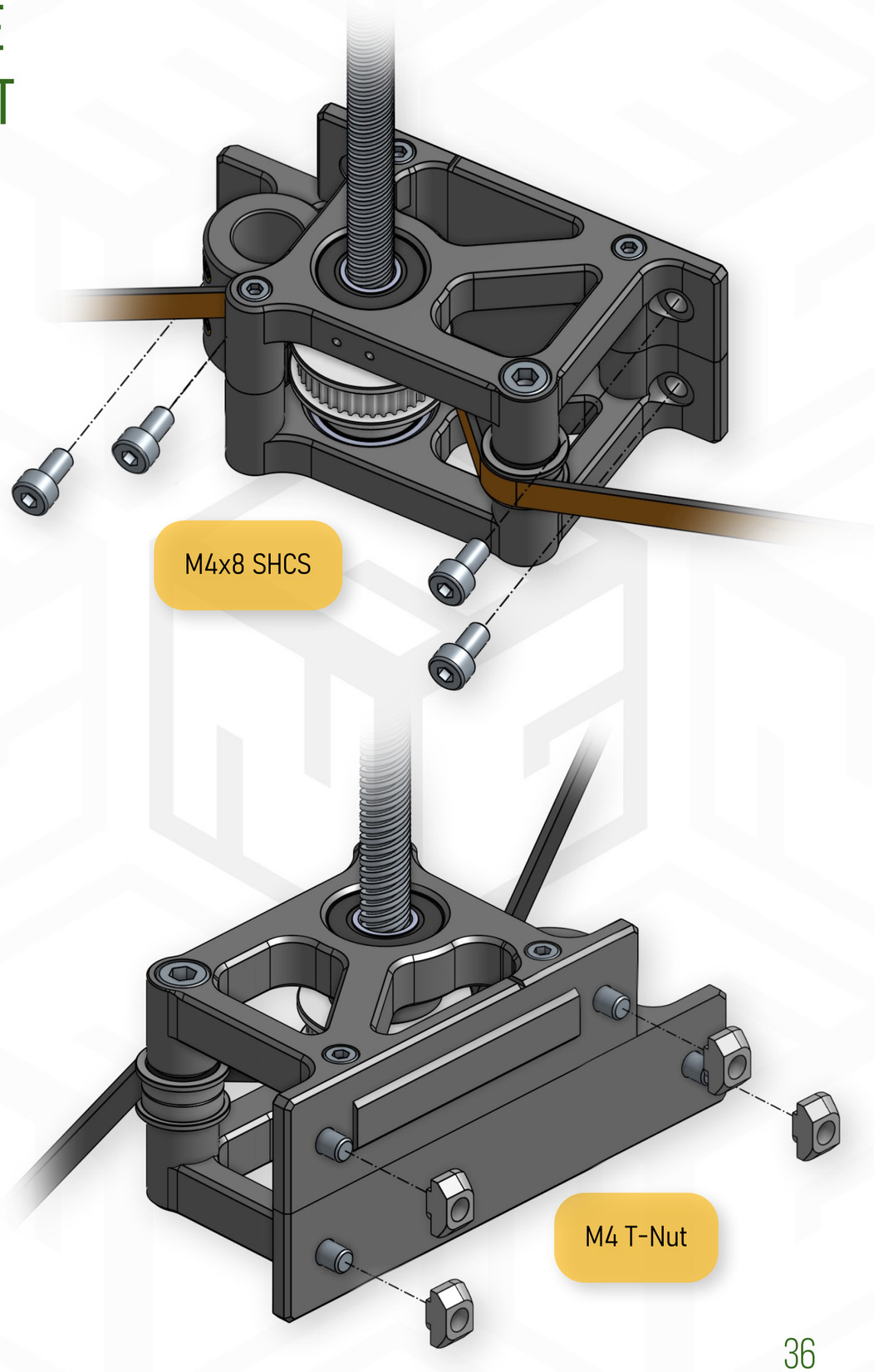
TOOLS:

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

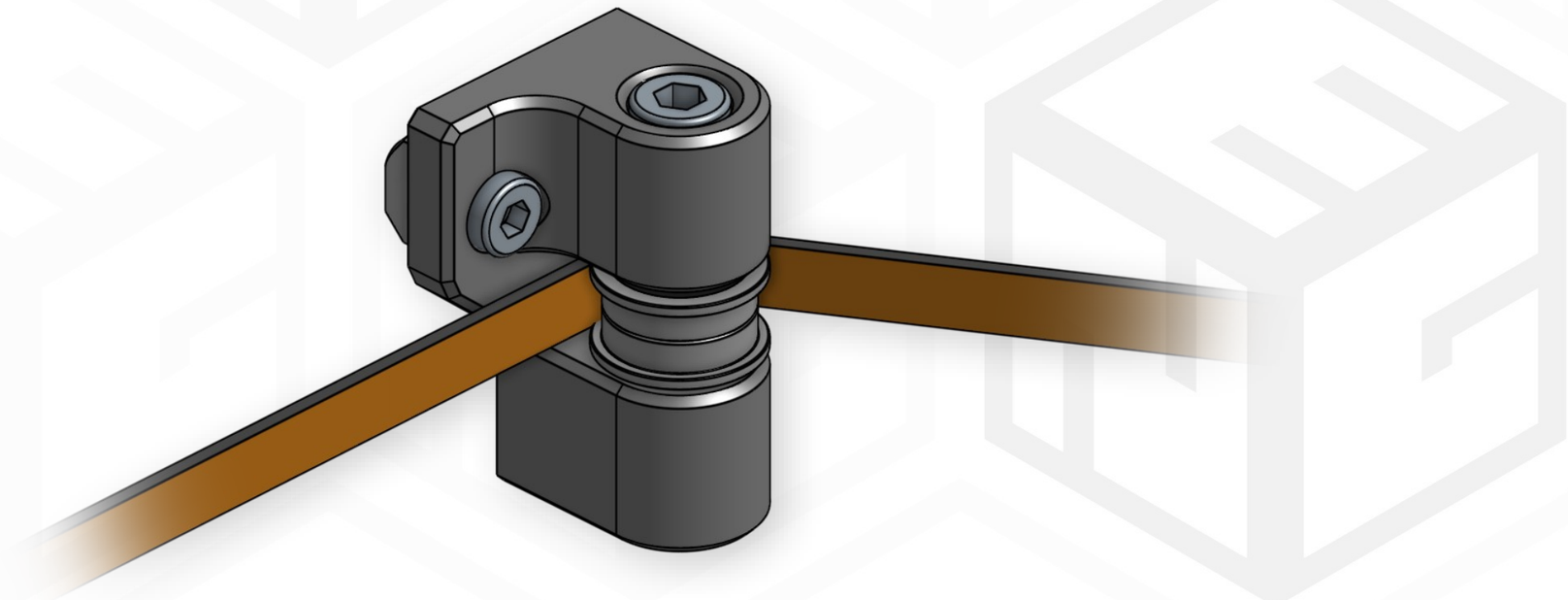
HARDWARE:

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





BOTTOM FRAME
Z BELT IDLER / TENSIONER



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

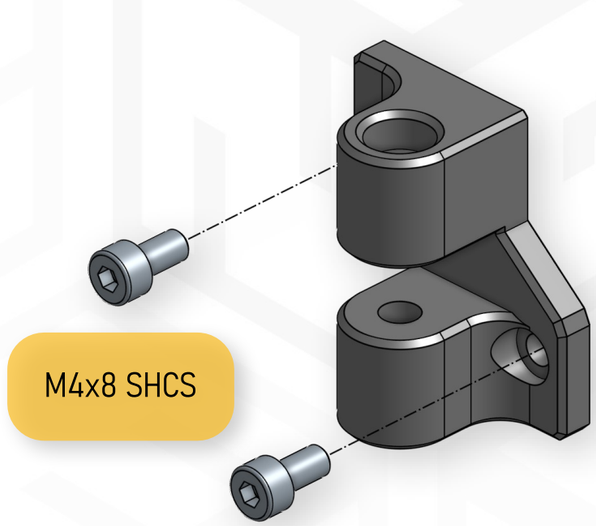
2x M4x8 SHCS
1x M5x35 SHCS

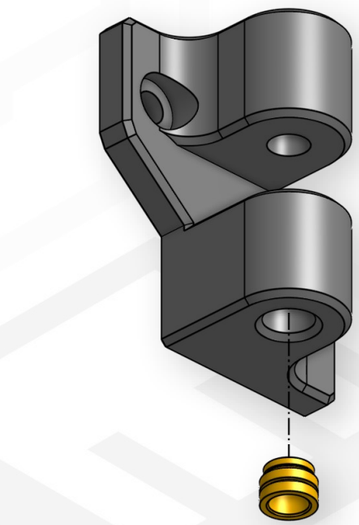
2x M4 T-Nut
2x M5 Washer

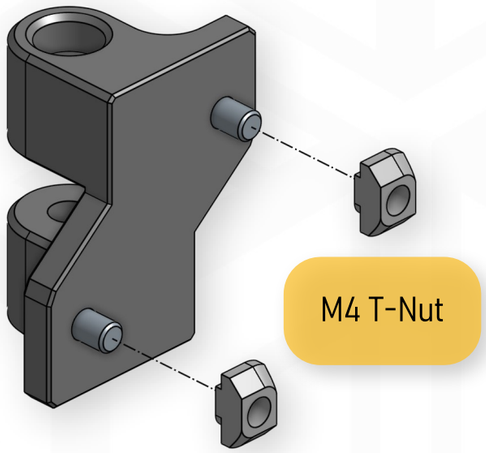
2x F695 2RS Ball bearing

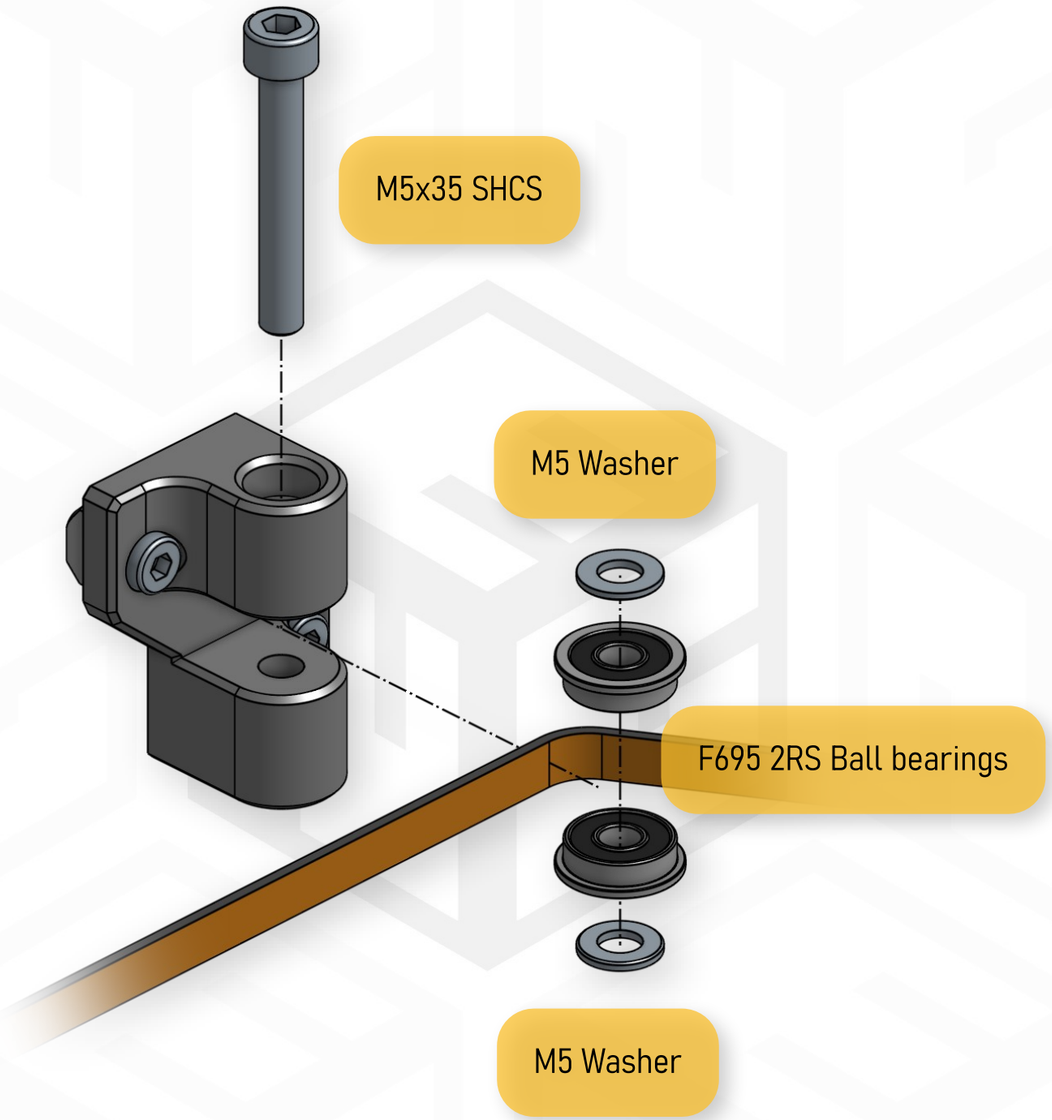
PRINTED PARTS:

frame_bottom_Z_idler.stl

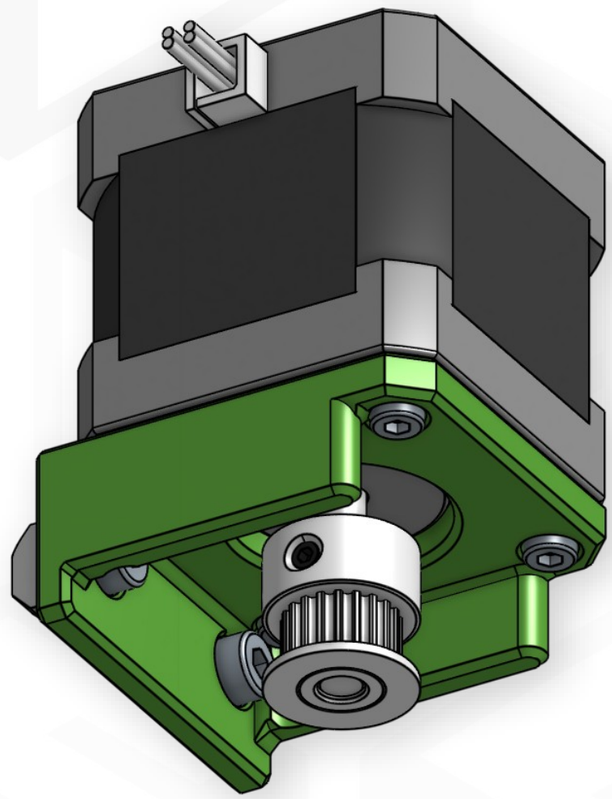








BOTTOM FRAME
Z STEPPER MOTOR ASSEMBLY



BOTTOM FRAME
Z STEPPER MOTOR ASSEMBLY

TOOLS:

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

HARDWARE:

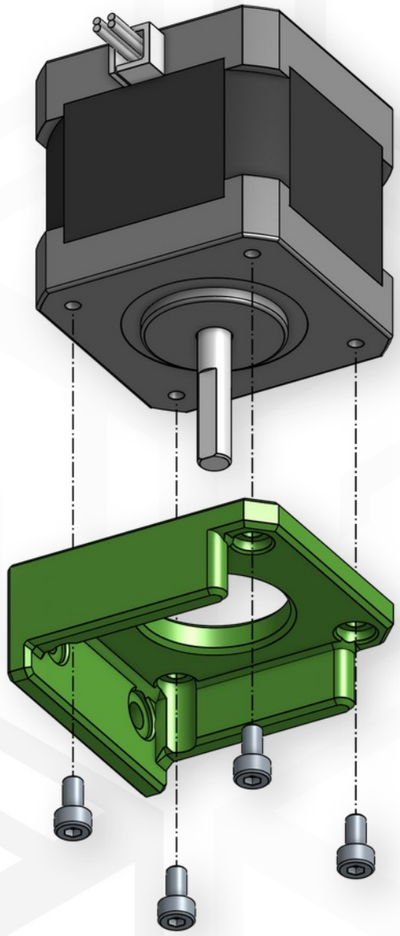
4x M3x6 SHCS
2x M4x8 SHCS

2x M4 T-Nut

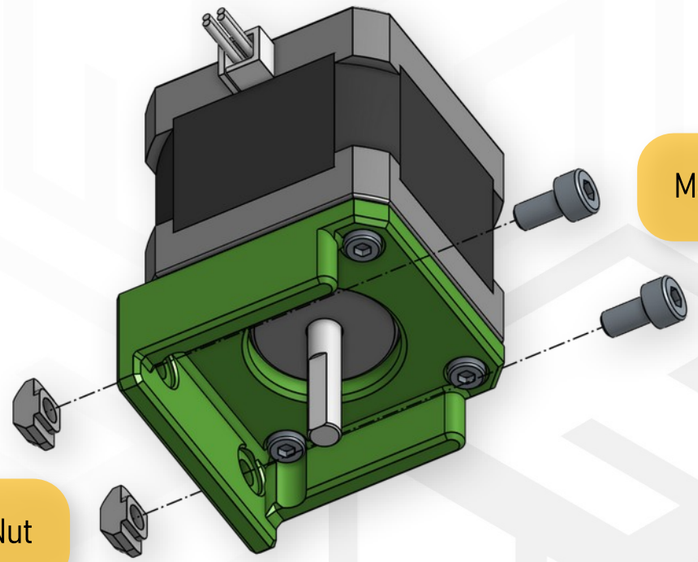
1x GT2 20T 5mm Pulley
1x Nema17 stepper motor

PRINTED PARTS:

frame_bottom_Z_stepper.stl



M3x6 SHCS



M4x8 SHCS

M4 T-Nut

20T GT2 Pulley

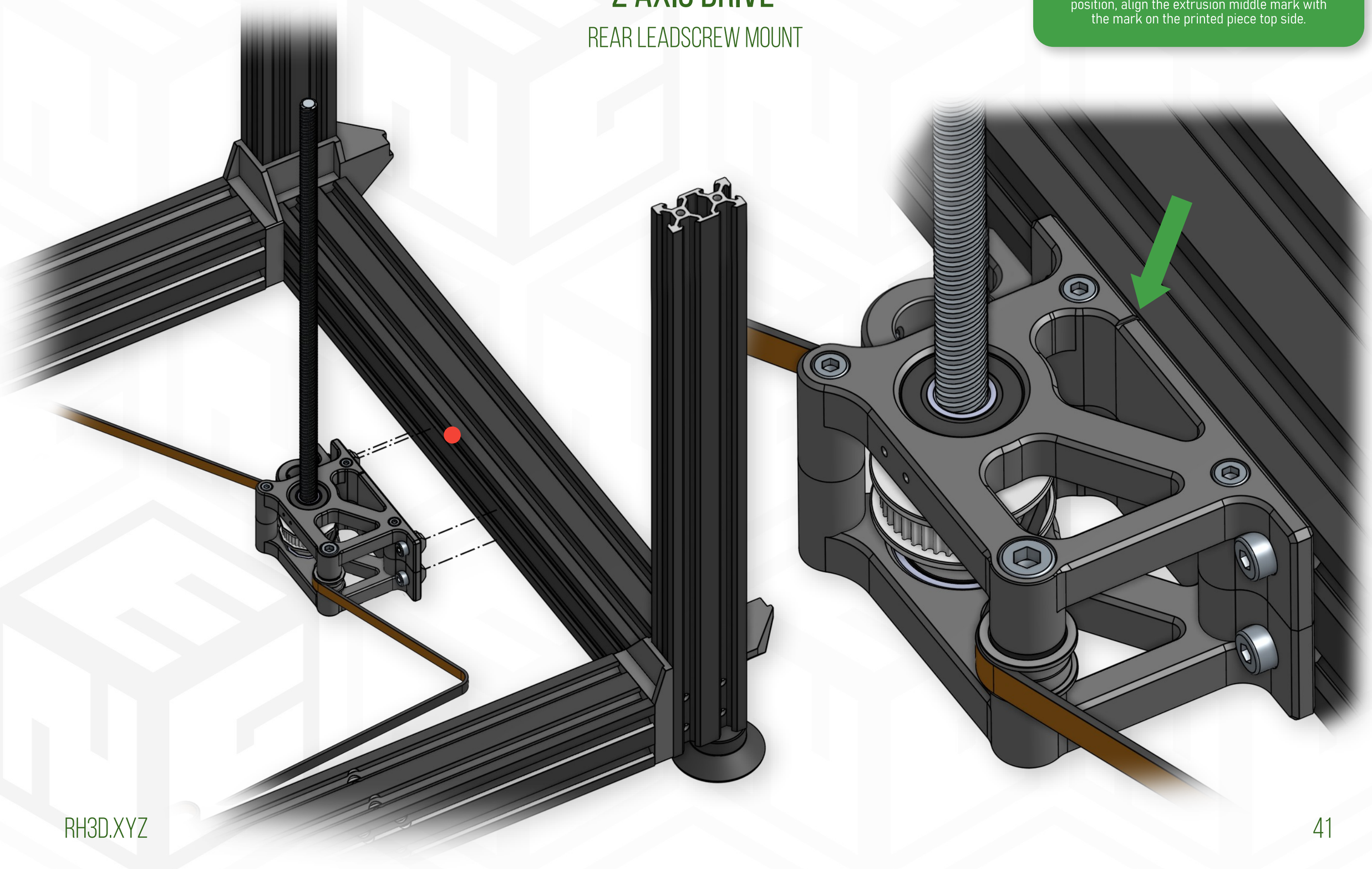
TOOLS:

3 mm Allen key

BOTTOM FRAME
Z AXIS DRIVE
REAR LEADSCREW MOUNT

NOTE: ALIGNMENT

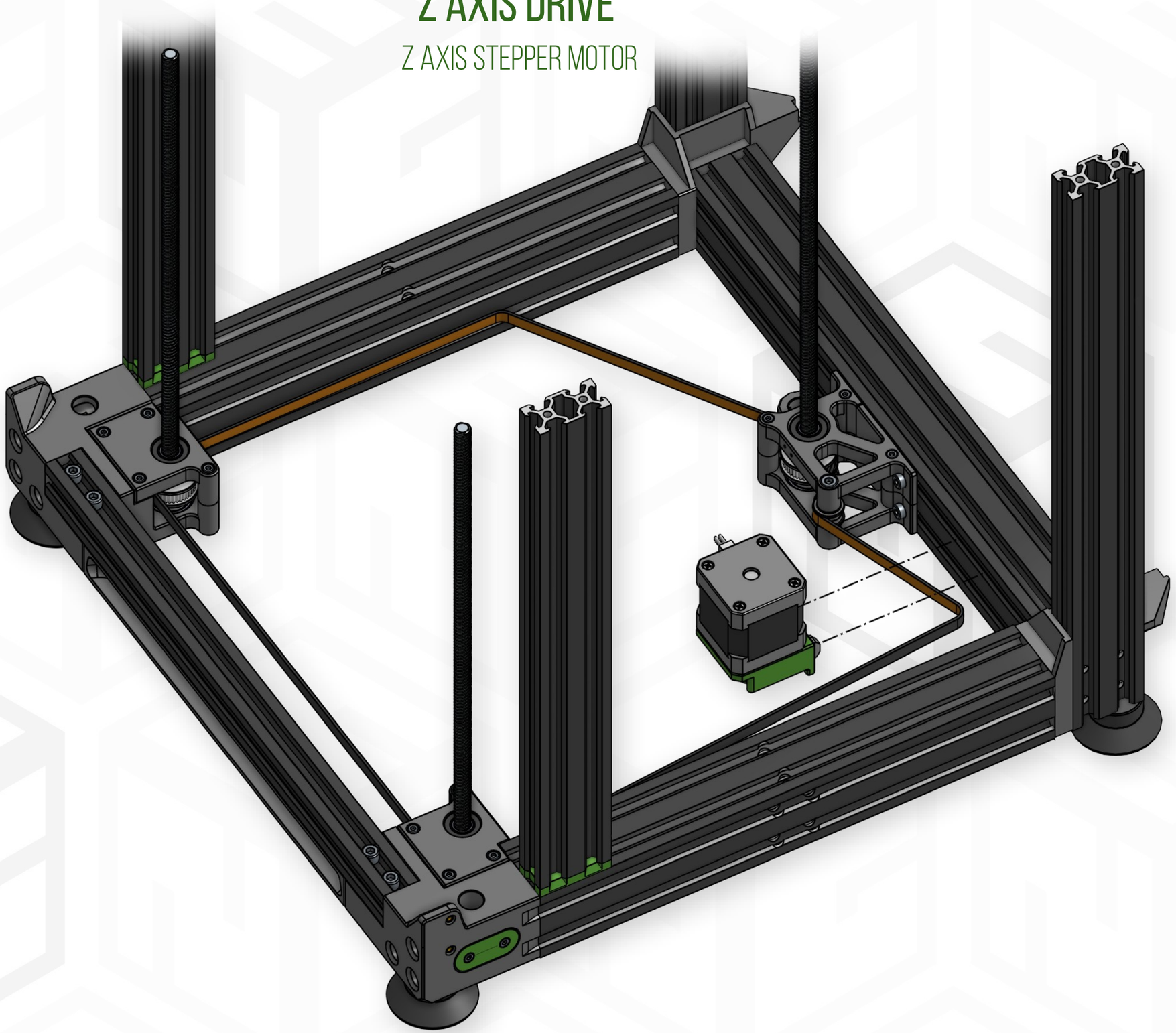
To move the rear leadscrew assembly to the correct position, align the extrusion middle mark with the mark on the printed piece top side.



TOOLS:

3 mm Allen key

BOTTOM FRAME
Z AXIS DRIVE
Z AXIS STEPPER MOTOR



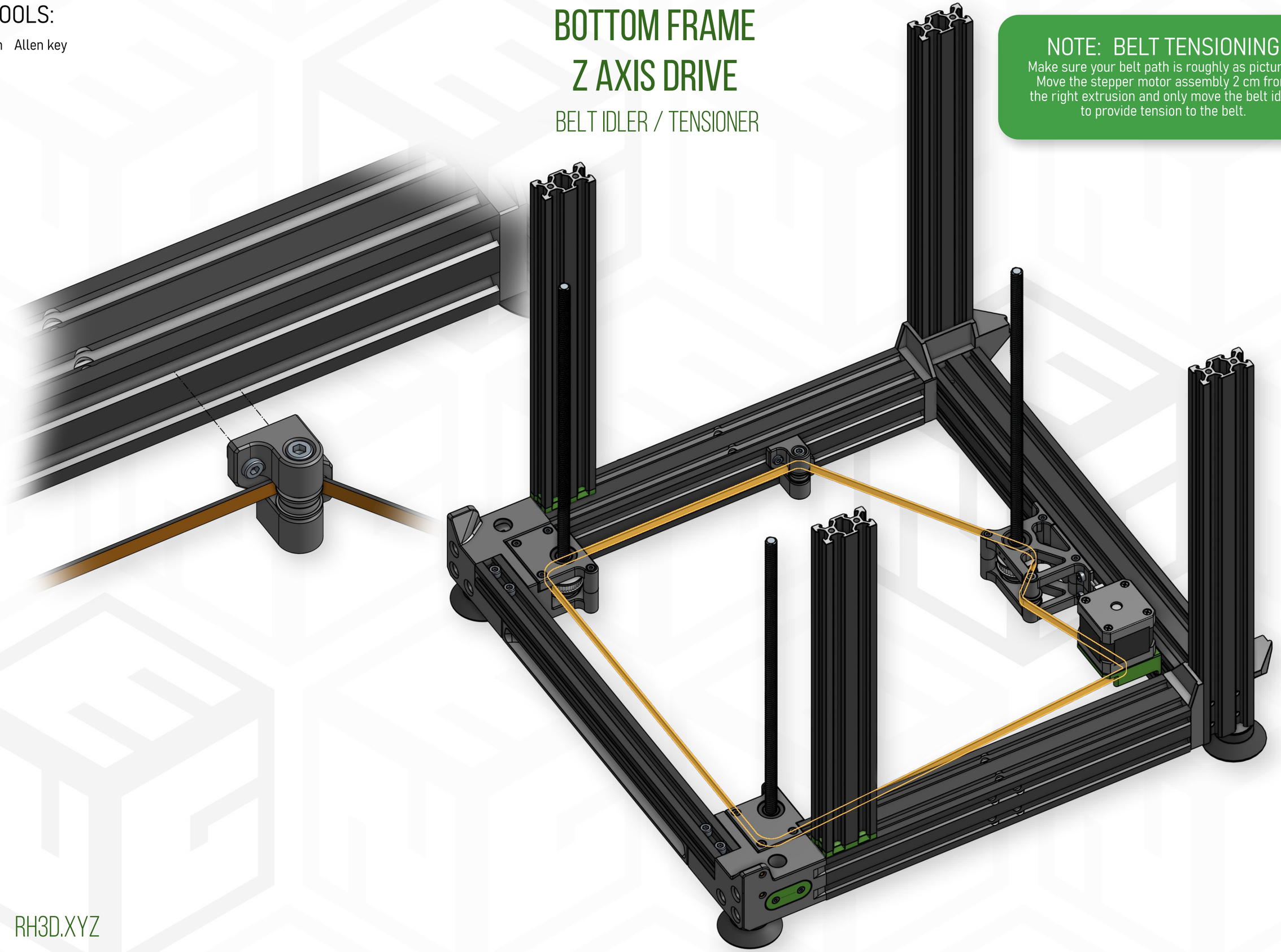
TOOLS:

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 cm from the right extrusion and only move the belt idler to provide tension to the belt.



BOTTOM FRAME
Z AXIS DRIVE
Z AXIS LINEAR RODS

TOOLS:

1.5 mm Allen key
2.5 mm Allen key

HARDWARE:

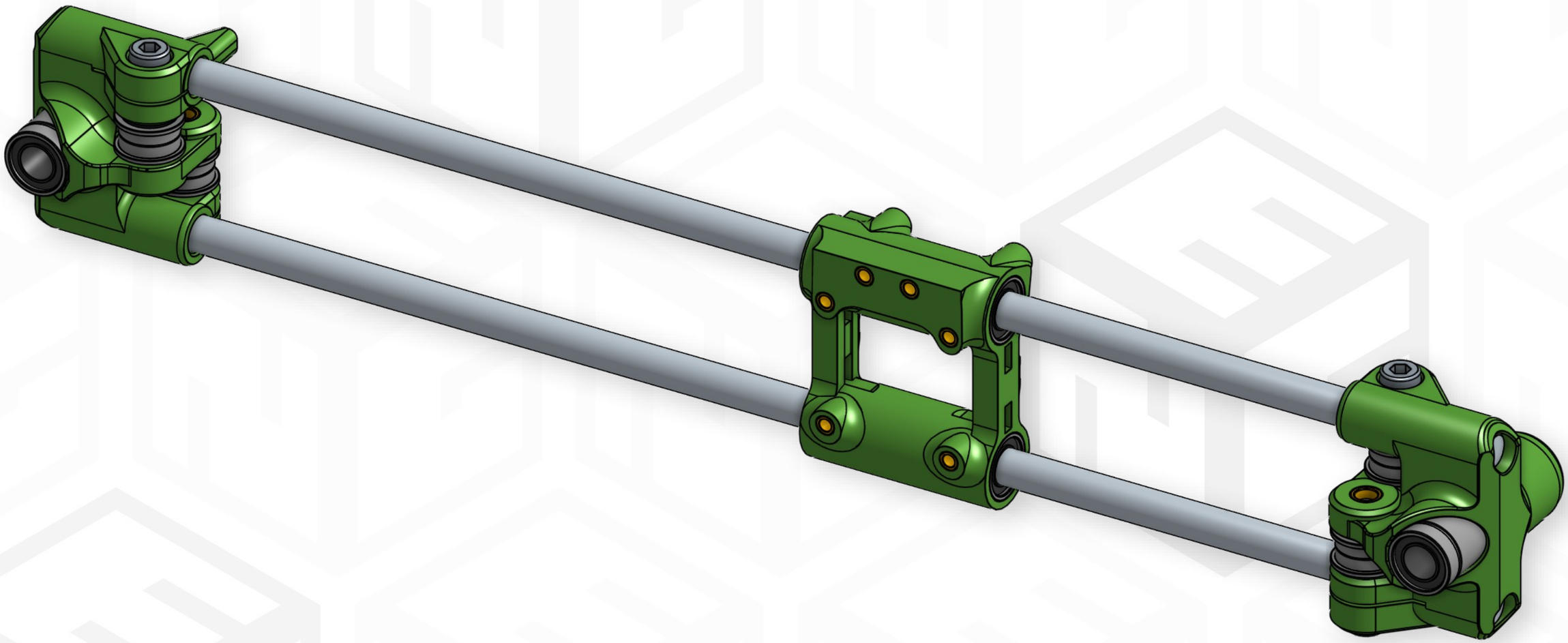
2x 12 x 350 mm Linear rod
1x 12 x 320 mm Linear rod

3x LM12UU Linear ball bearing

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.

XY GANTRY

WARNING: LM8LUU
Did you clean and lubricate the LM8LUU bearings?



XY GANTRY
Y GANTRY BLOCKS

TOOLS:

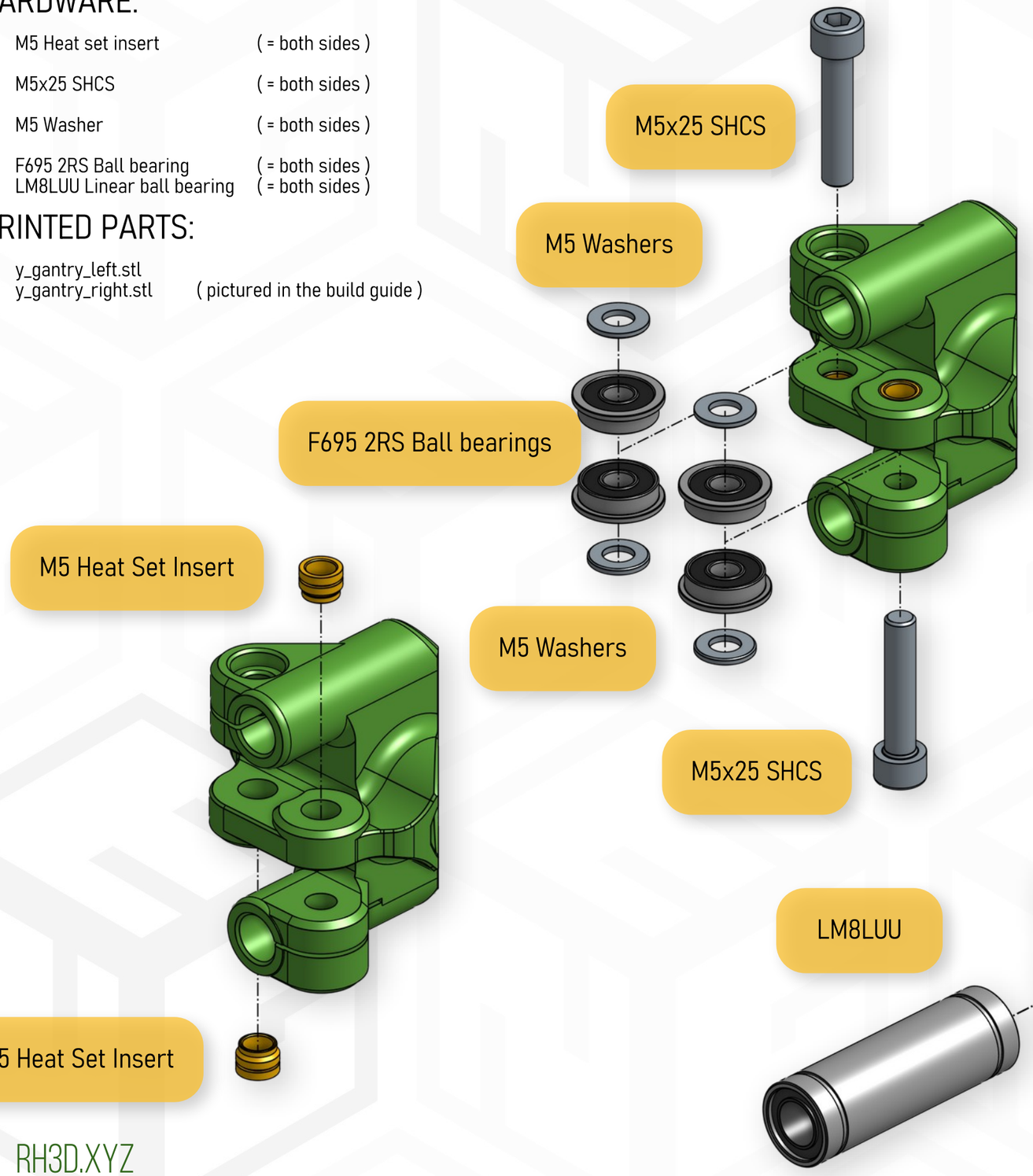
Heat set insert press
4 mm Allen key

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)



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

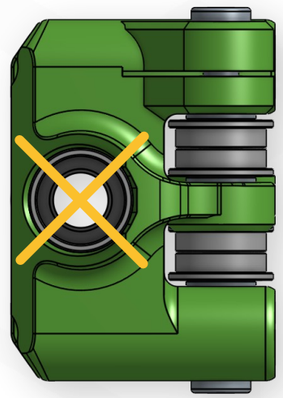
The M5 inserts are in a tight place with no room for standard install procedure. To install them, use the tool tip under an angle to heat up the insert and slowly push in. When close to the final position, use M5 screw to pull the insert from the other side to align it. Take your time and don't rush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



XY GANTRY
X CARRIAGE

TOOLS:

Heat set insert press

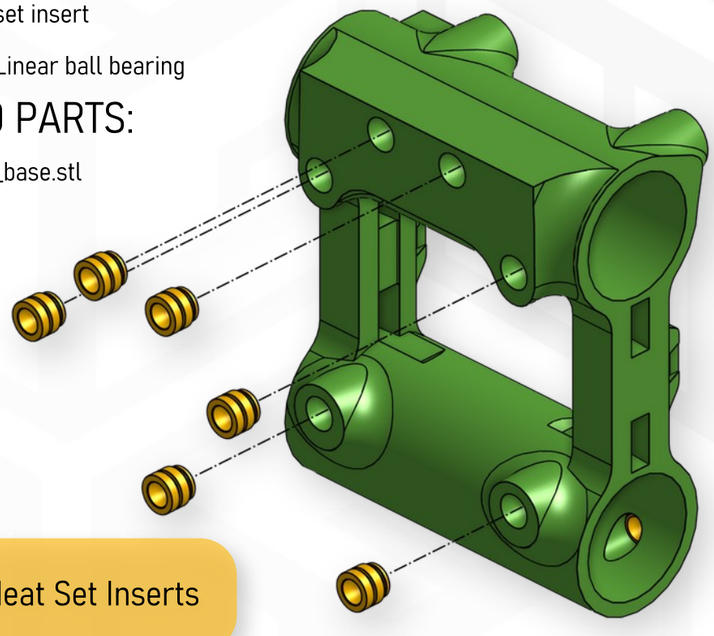
HARDWARE:

10x M3 Heat set insert

2x LM8LUU Linear ball bearing

PRINTED PARTS:

toolhead_base.stl



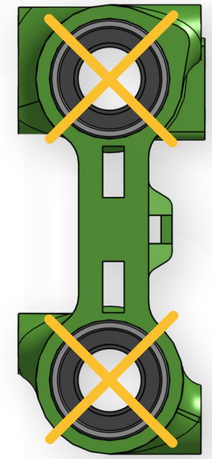
M3 Heat Set Inserts

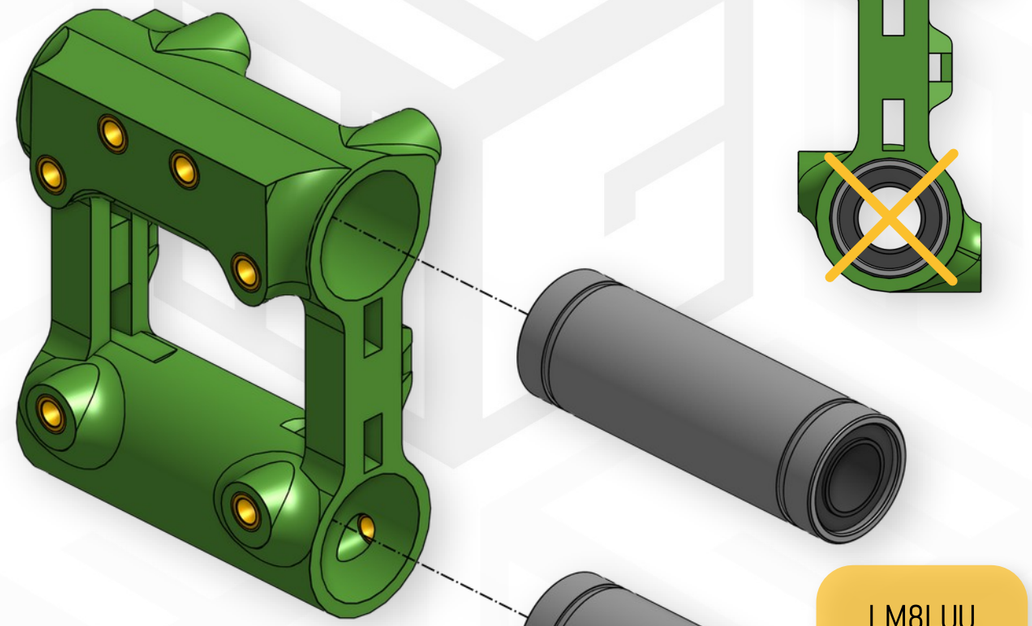
TIP: PRECISION FIT

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..

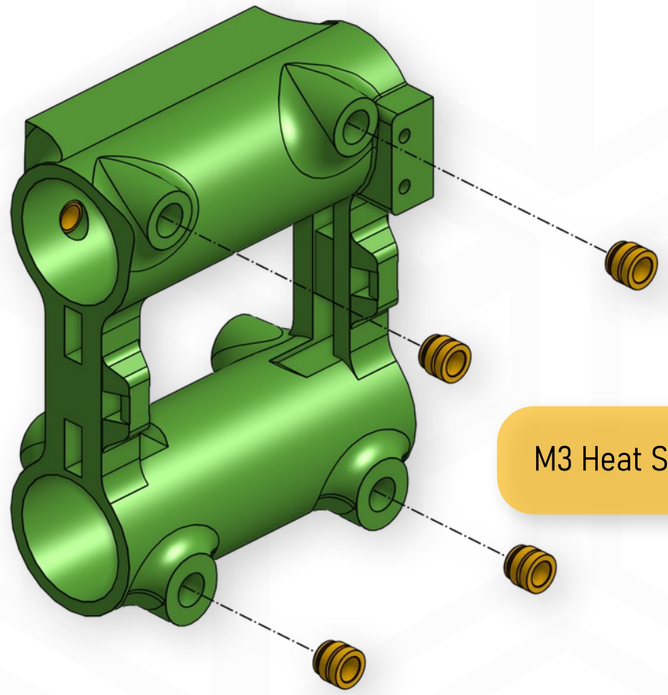
WARNING: LM8LUU INSTALL

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





LM8LUU



M3 Heat Set Inserts

XY GANTRY ASSEMBLY

TOOLS:

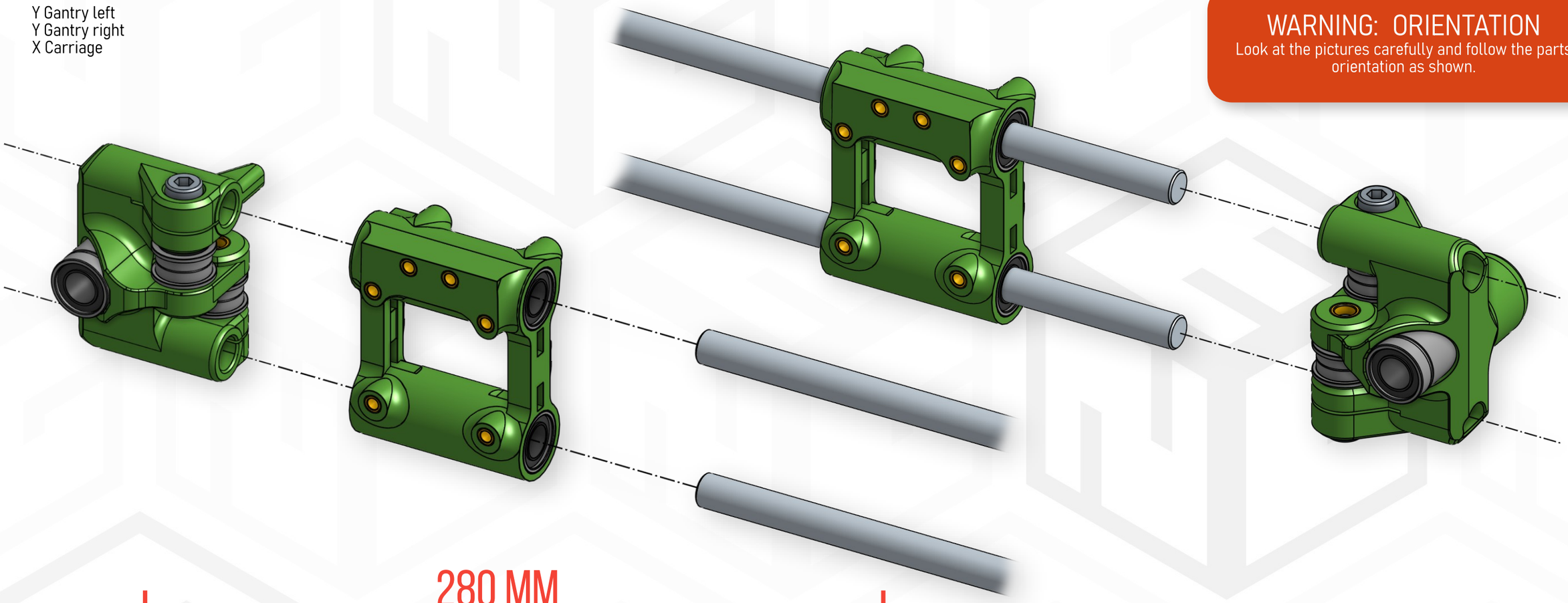
4 mm Allen key

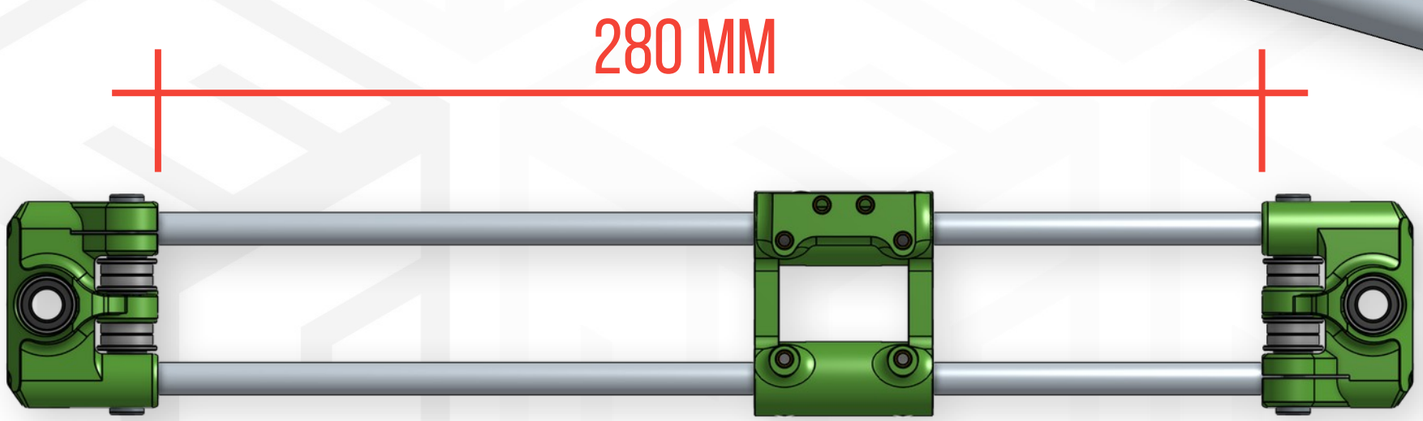
HARDWARE:

2x 8 x 350 mm Linear rod

ASSEMBLIES:

Y Gantry left
Y Gantry right
X Carriage





NOTE: X SPACING

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

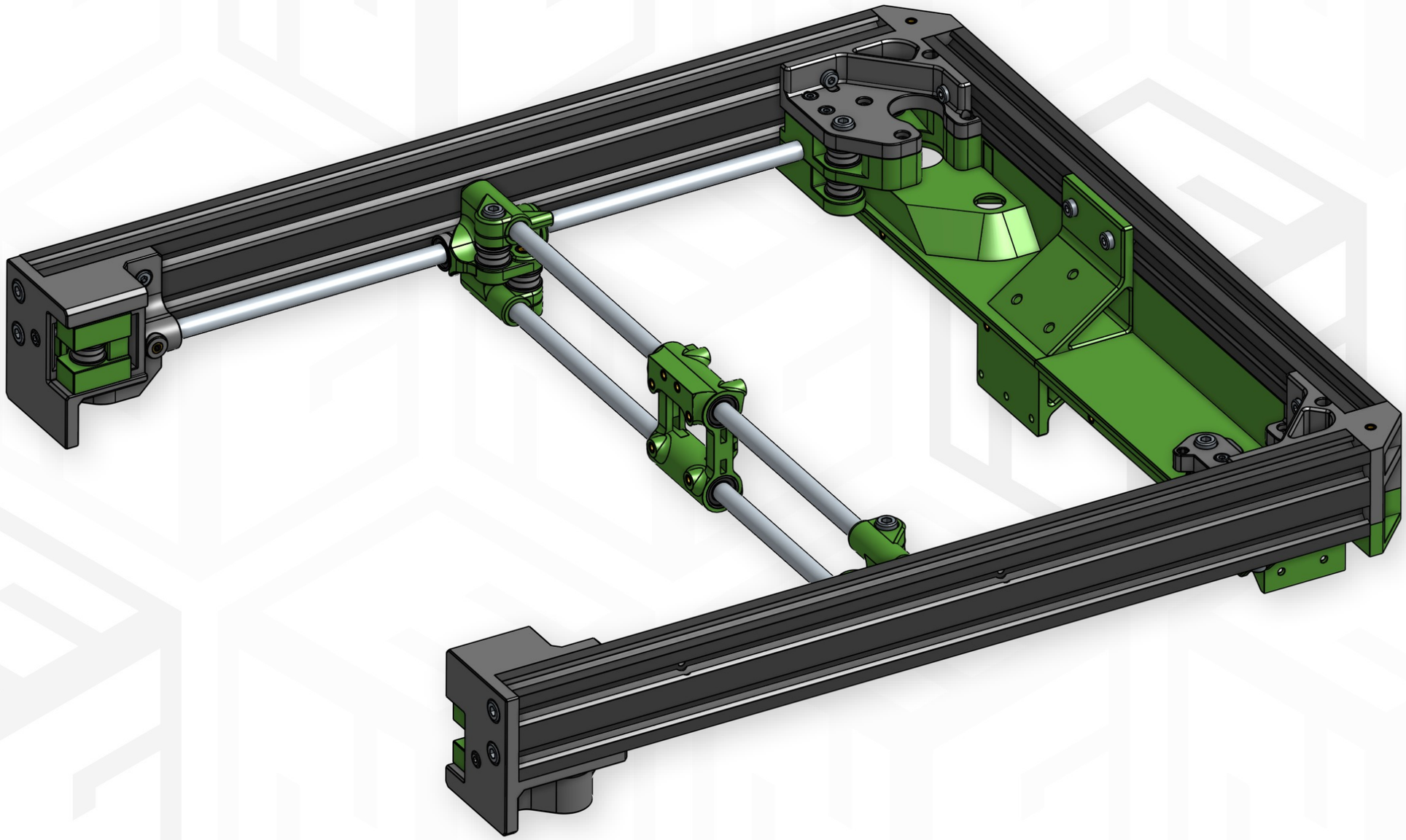
WARNING: ORIENTATION

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



TOP FRAME
B STEPPER MOTOR MOUNT (LEFT)
HEAT SET INSERTS

TOOLS:

Heat set insert press

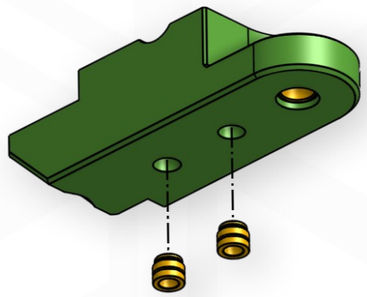
HARDWARE:

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

PRINTED PARTS:

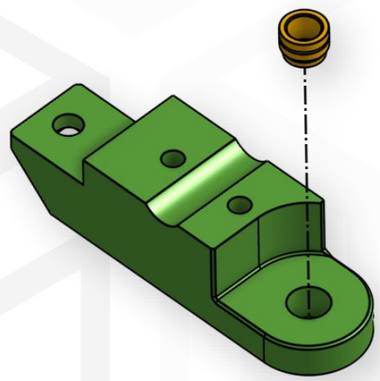
frame_top_rear_B_left_top.stl
frame_top_rear_B_left_middle.stl
frame_top_rear_B_left_bottom.stl

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.

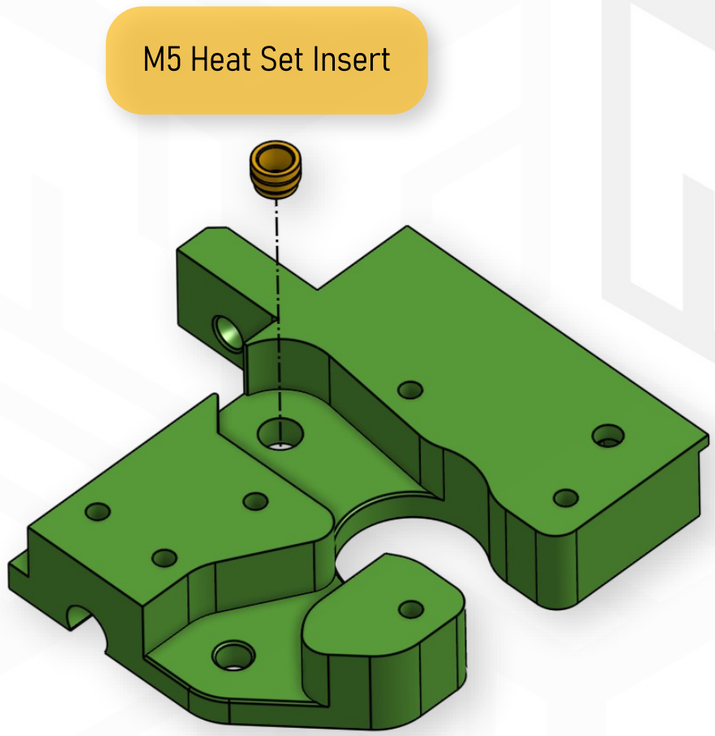


M3 Heat Set Inserts

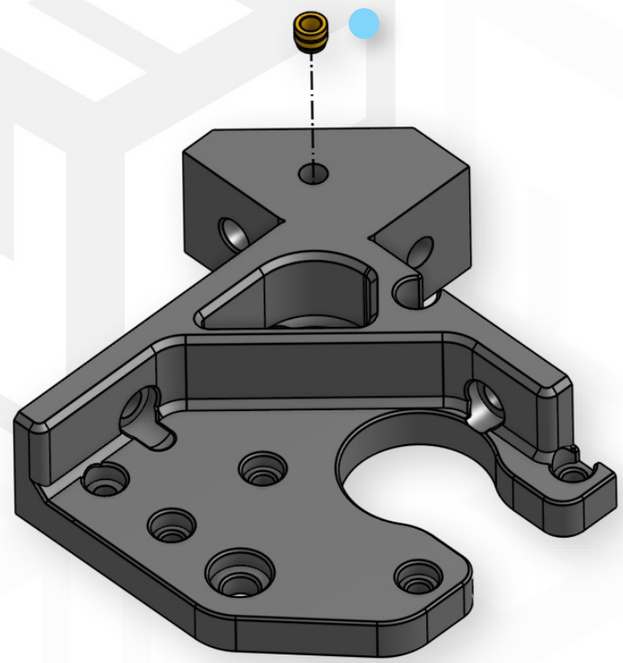
M5 Heat Set Insert



M5 Heat Set Insert



M3 Heat Set Insert



TOP FRAME
B STEPPER MOTOR MOUNT (LEFT)
ASSEMBLY

TOOLS:

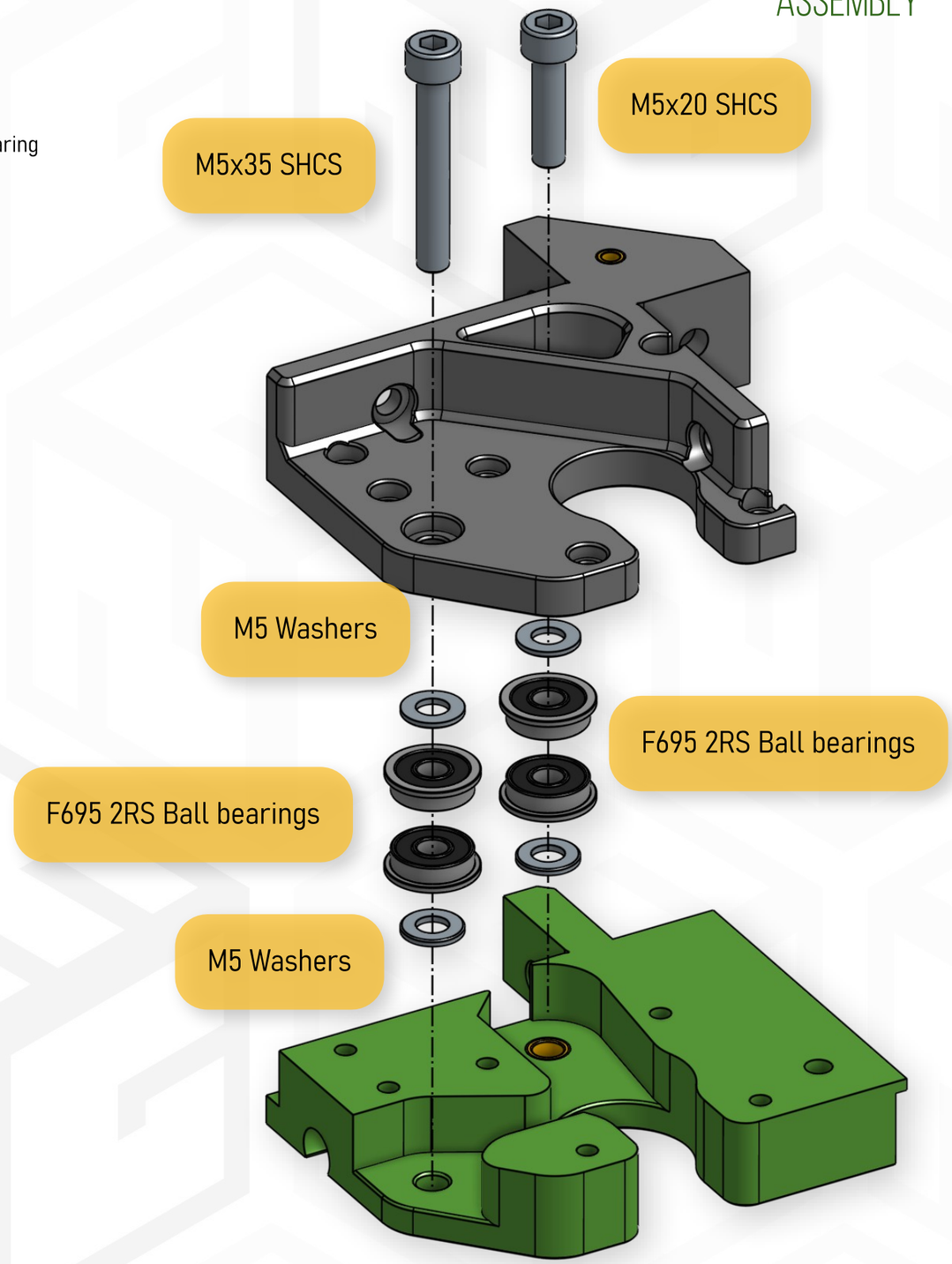
2.5 mm Allen key
4 mm Allen key

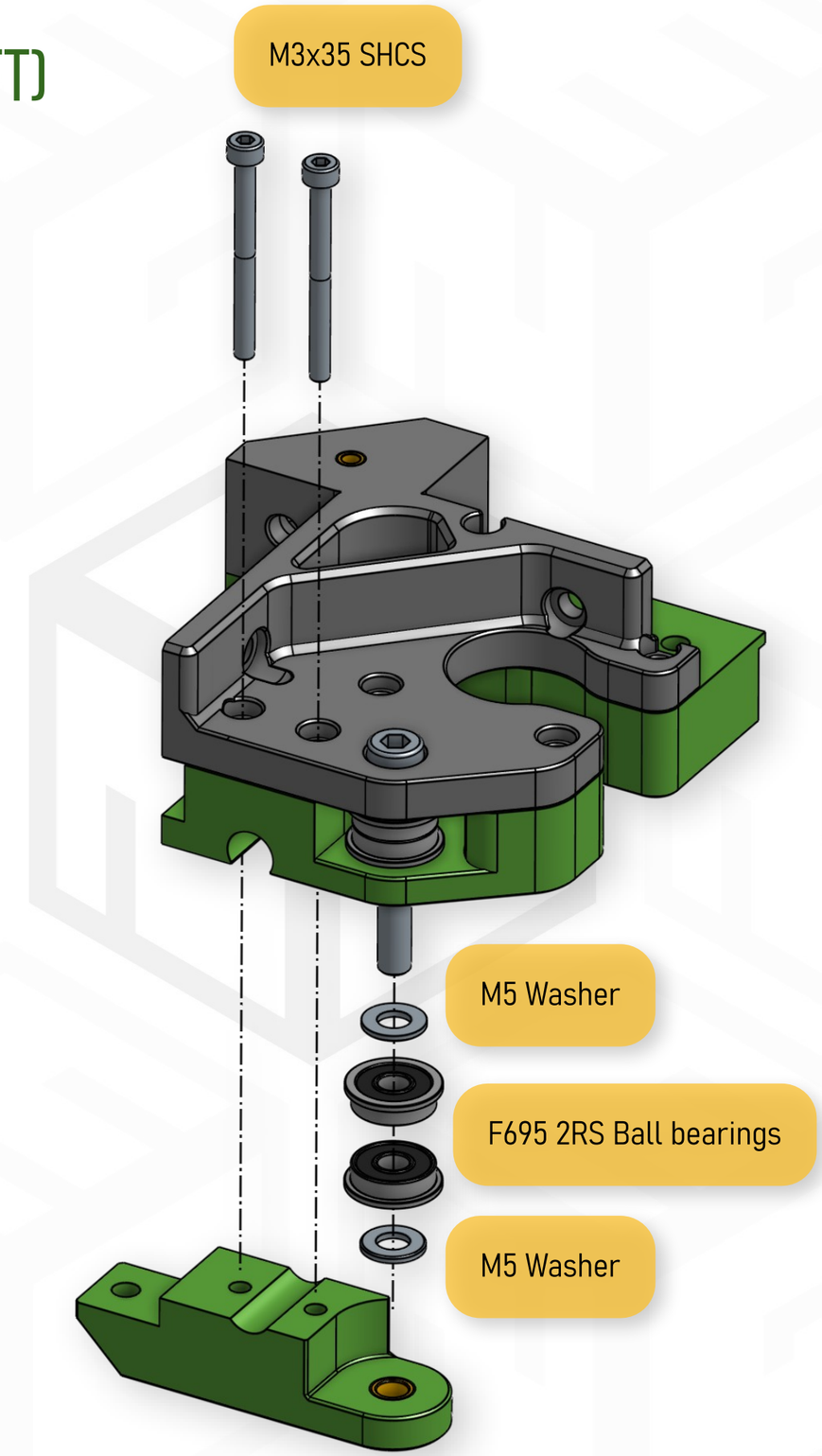
HARDWARE:

2x M3x35 SHCS
1x M5x20 SHCS
1x M5x35 SHCS

6x M5 Washer

6x F695 2RS Ball bearing





TOP FRAME
B STEPPER MOTOR MOUNT (LEFT)

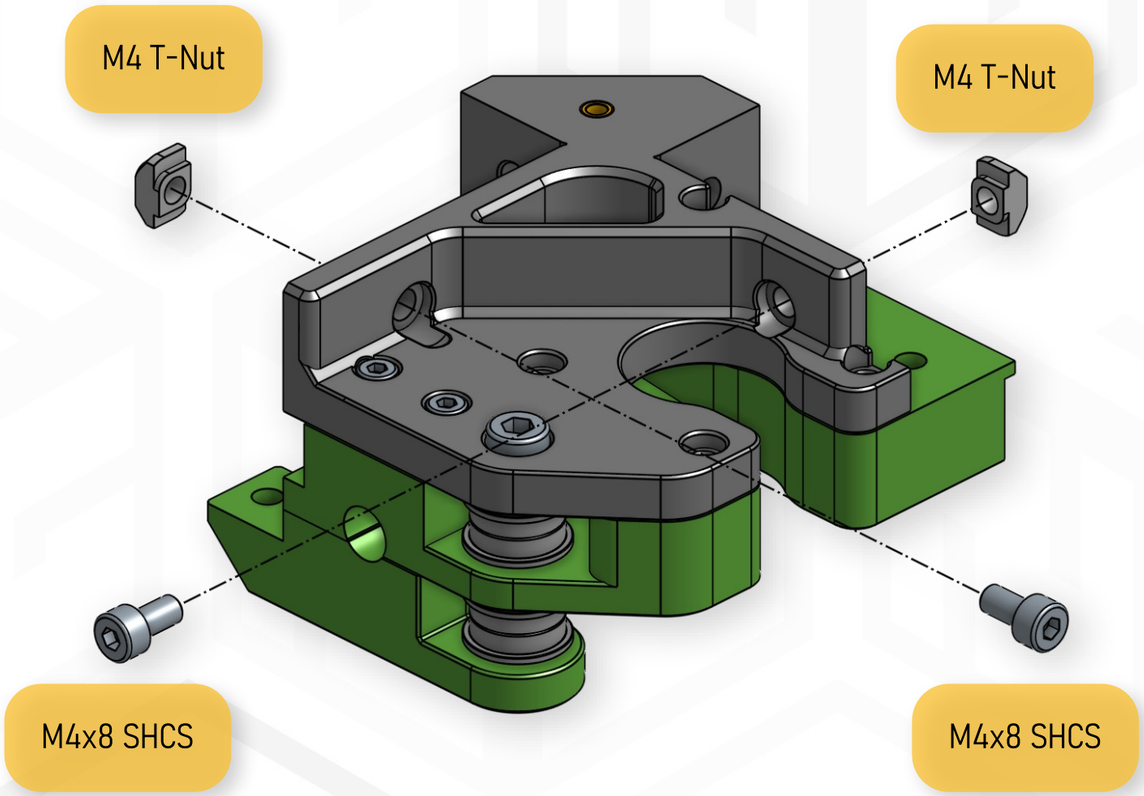
TOOLS:

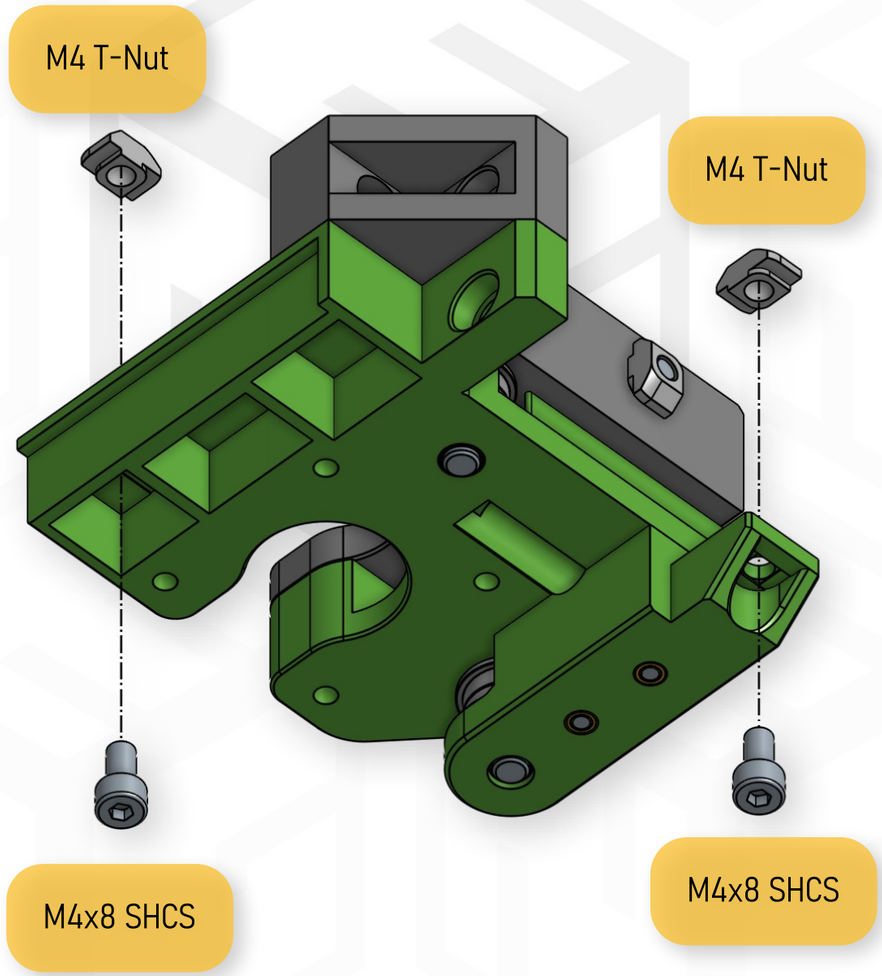
3 mm Allen key

HARDWARE:

4x M4x8 SHCS

4x M4 T-Nut





TOP FRAME
A STEPPER MOTOR MOUNT (RIGHT)

HEAT SET INSERTS

TOOLS:

Heat set insert press

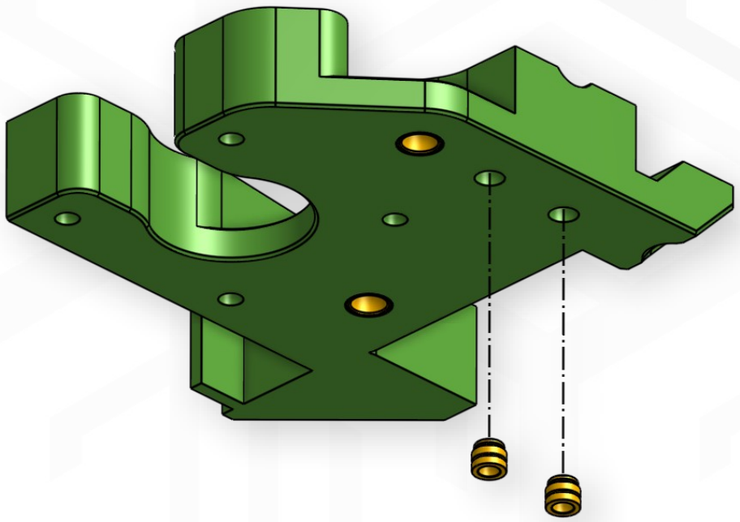
HARDWARE:

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

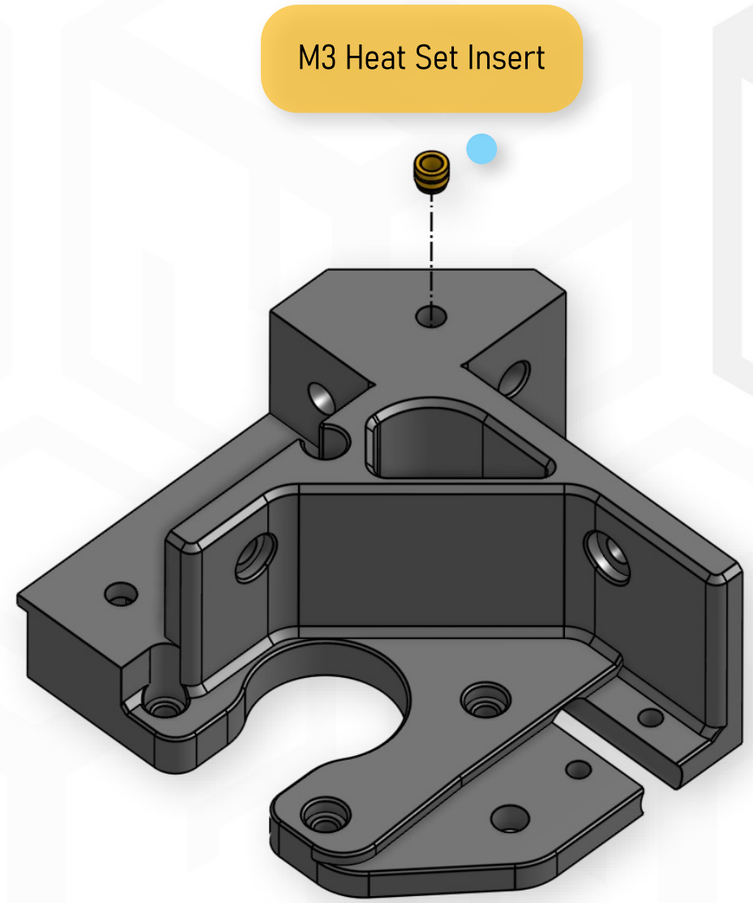
PRINTED PARTS:

frame_top_rear_A_right_middle.stl
frame_top_rear_A_right_bottom.stl

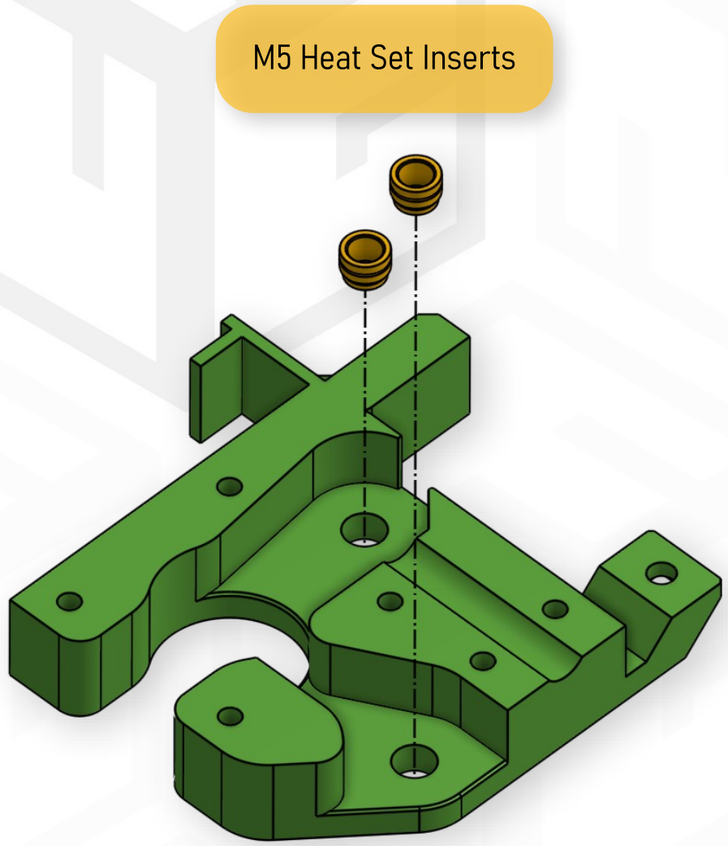
TIP: ENCLOSURE
The marked heat insert is used for installing the enclosure, so if you are not going to enclose the printer, you can choose not to install it.



M3 Heat Set Inserts



M3 Heat Set Insert



M5 Heat Set Inserts

TOP FRAME
A STEPPER MOTOR MOUNT (RIGHT)

ASSEMBLY

TOOLS:

2.5 mm Allen key
4 mm Allen key

HARDWARE:

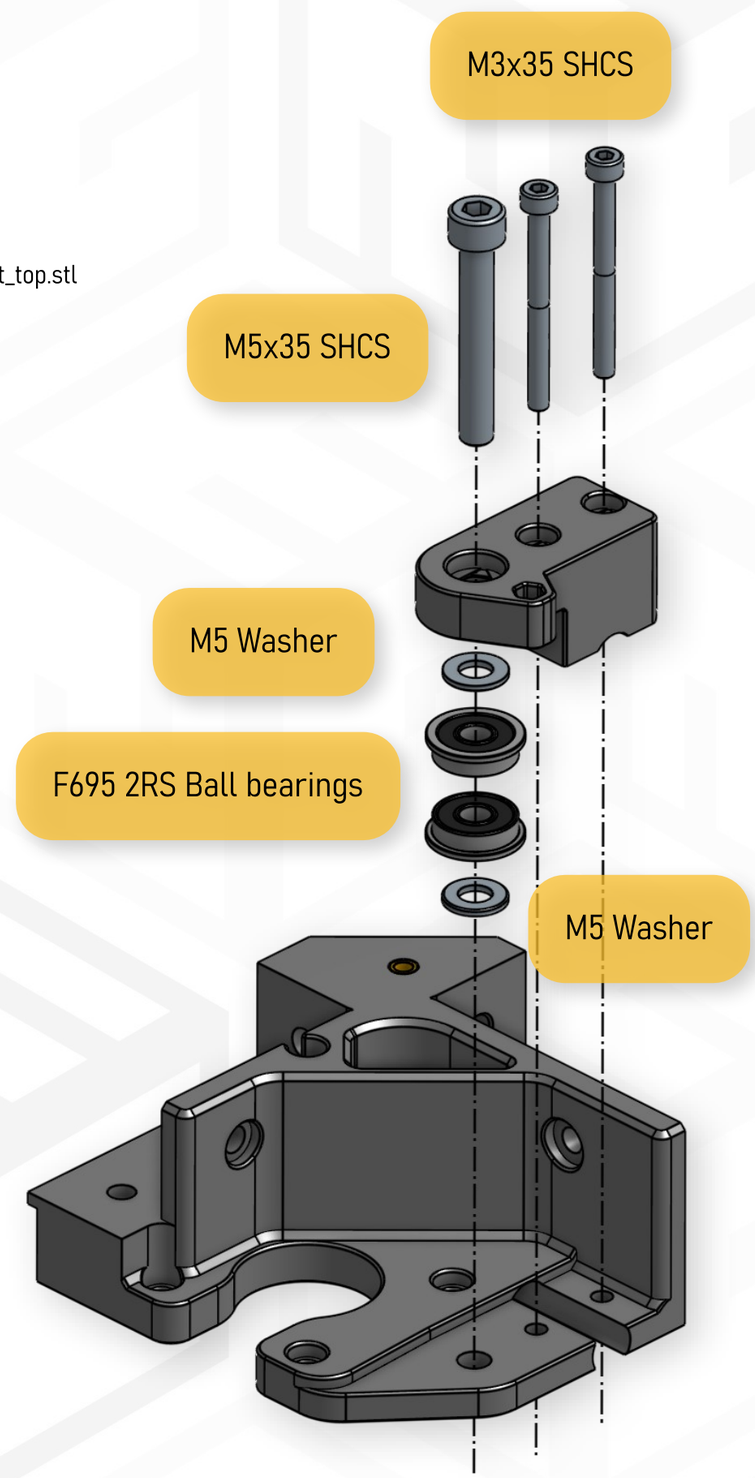
2x M3x35 SHCS
1x M5x20 SHCS
1x M5x35 SHCS

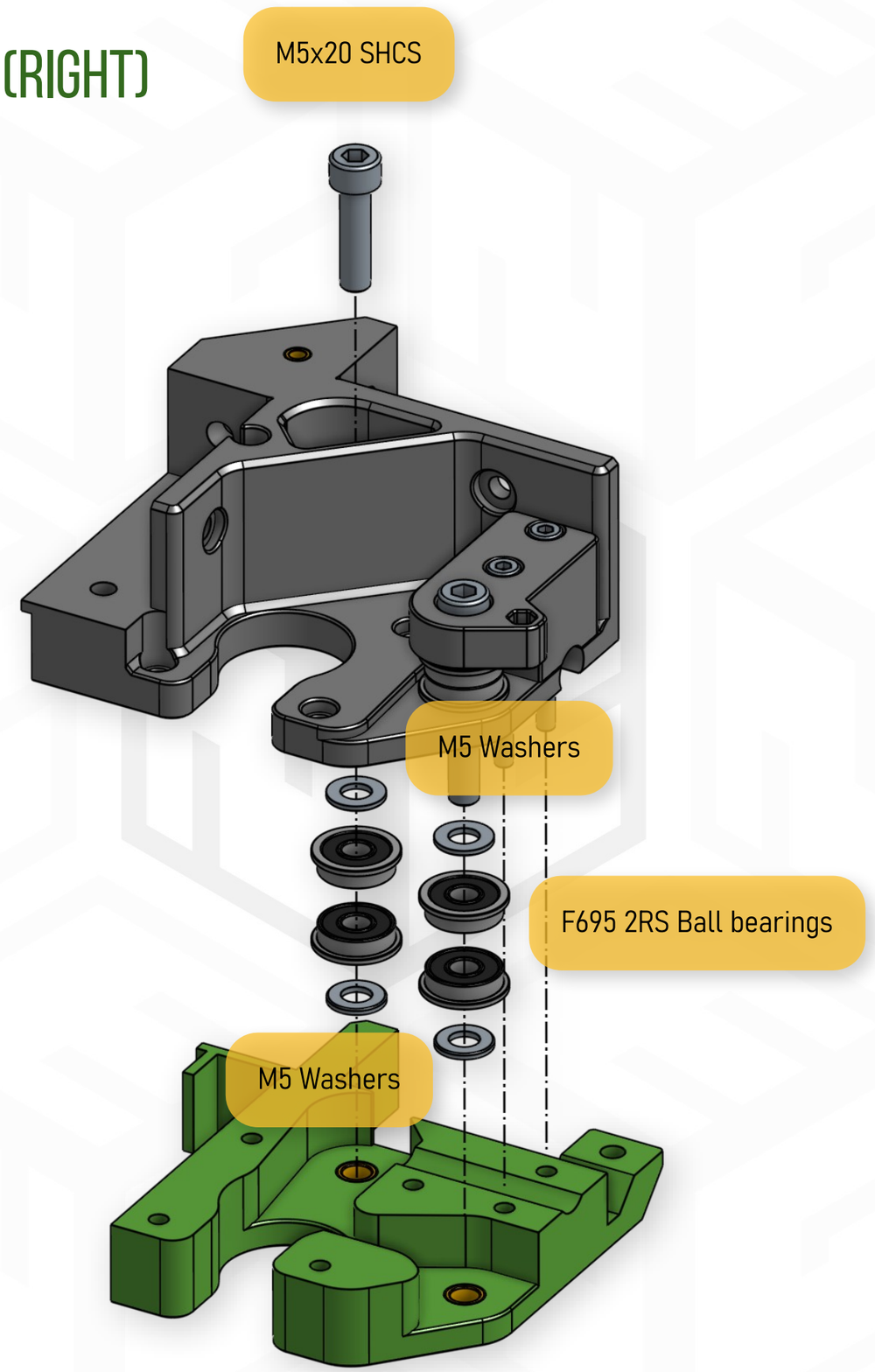
6x M5 Washer

6x F695 2RS Ball bearing

PRINTED PARTS:

frame_top_rear_A_right_top.stl





TOP FRAME
A STEPPER MOTOR MOUNT (RIGHT)

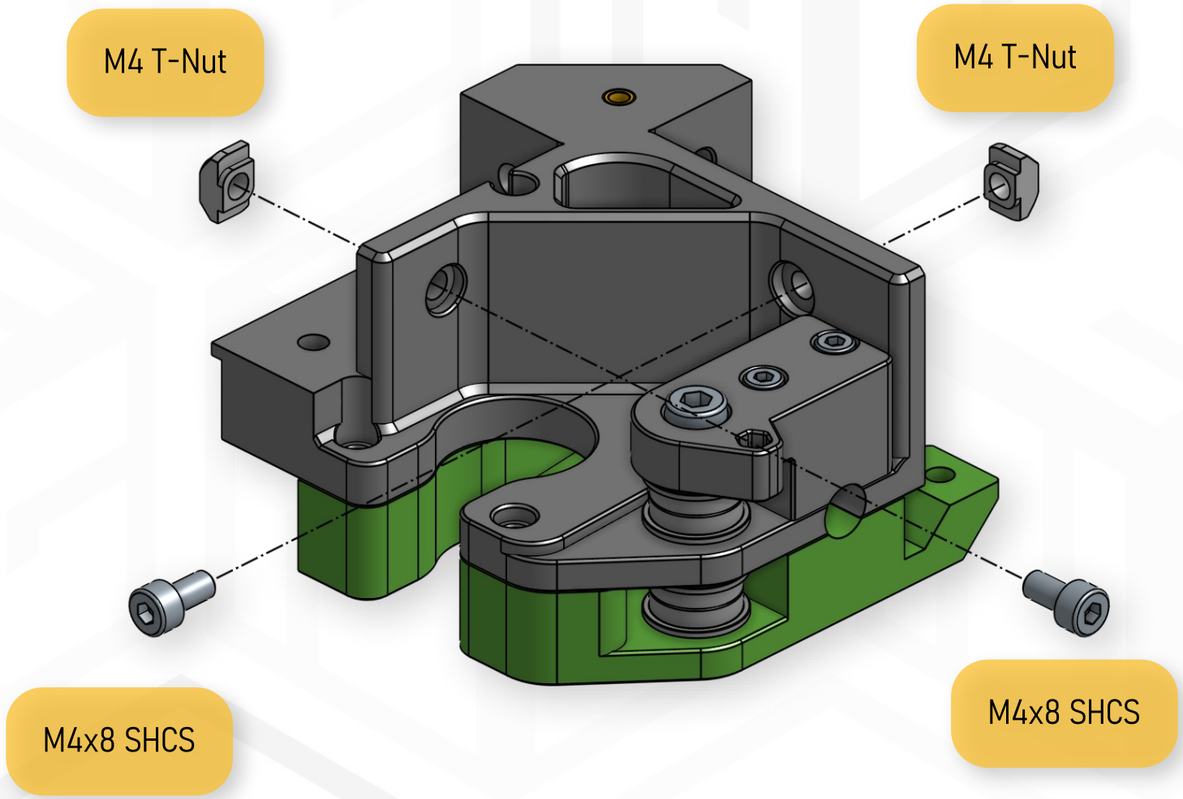
TOOLS:

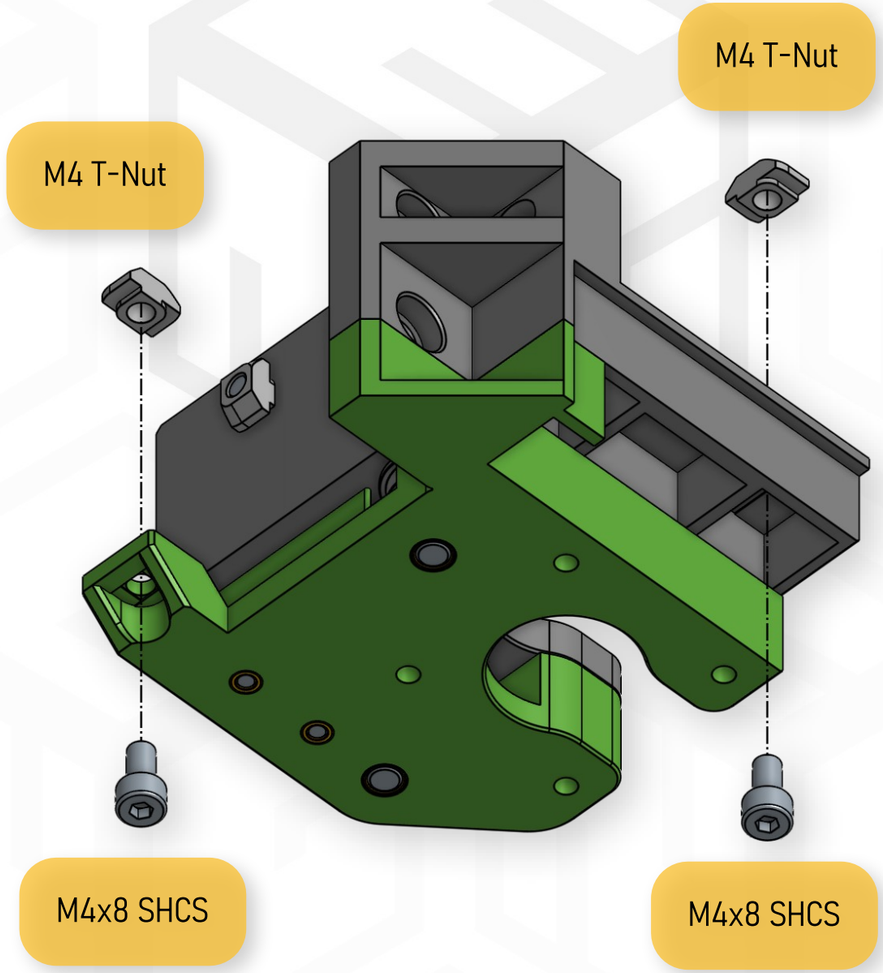
3 mm Allen key

HARDWARE:

4x M4x8 SHCS

4x M4 T-Nut





TOP FRAME
FRONT CORNERS

HEAT SET INSERTS

TOOLS:

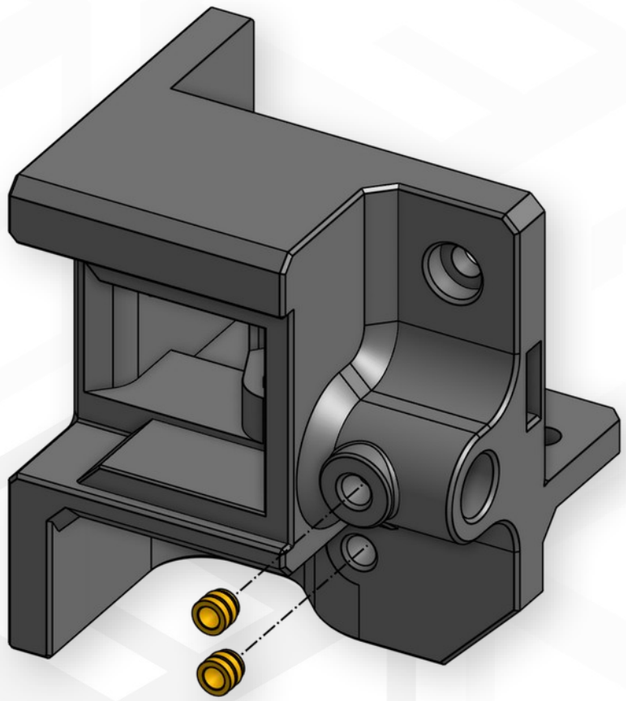
Heat set insert press

HARDWARE:

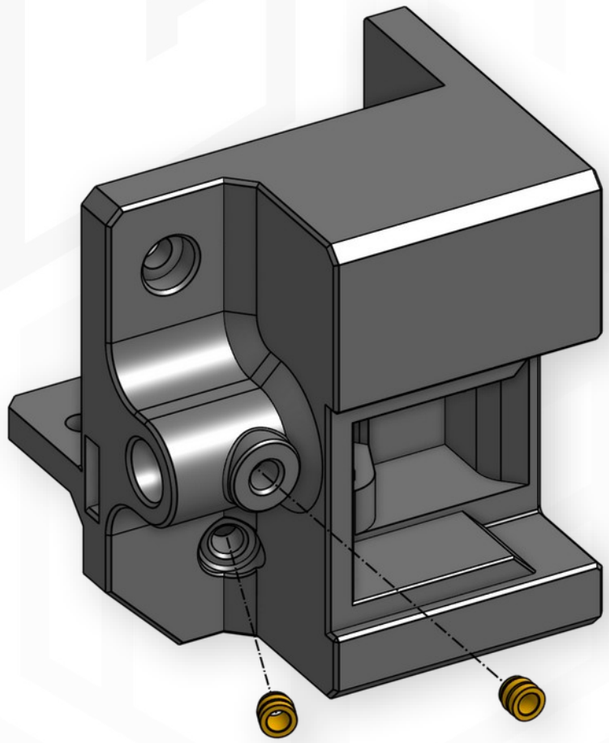
6x M3 Heat set insert
2x M5 Heat set insert

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

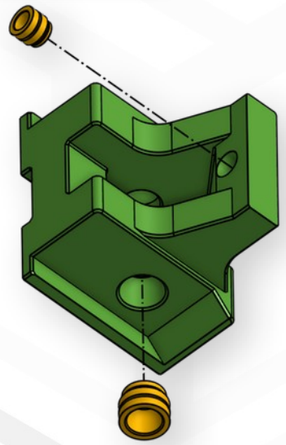


M3 Heat Set Inserts



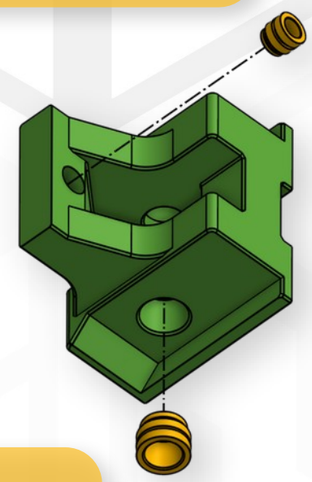
M3 Heat Set Inserts

M3 Heat Set Insert



M5 Heat Set Insert

M3 Heat Set Insert



M5 Heat Set Insert

TOP FRAME
FRONT CORNERS
LEFT ASSEMBLY

TOOLS:

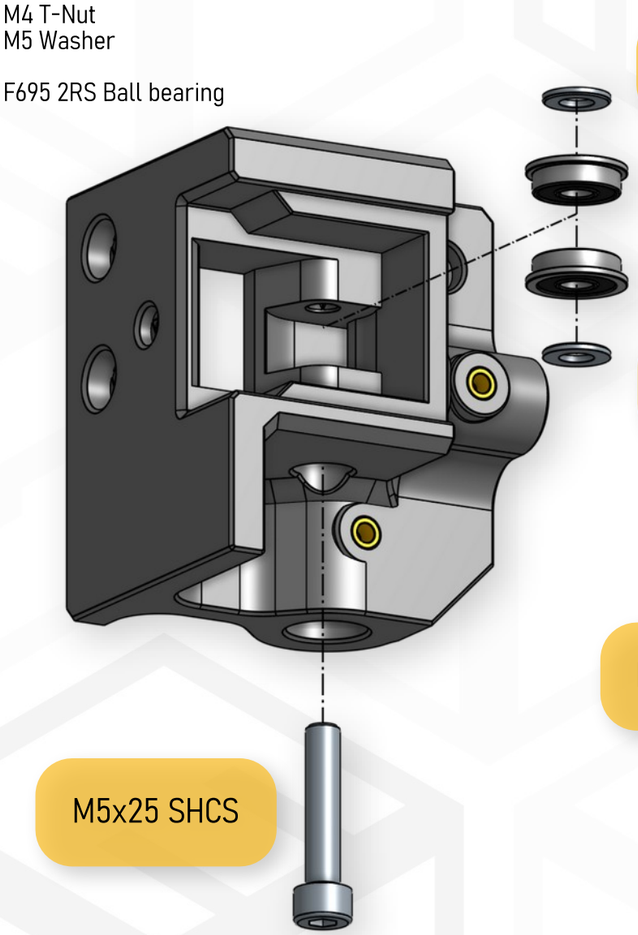
1.5 mm Allen key
2.5 mm Allen key
3 mm Allen key
4 mm Allen key

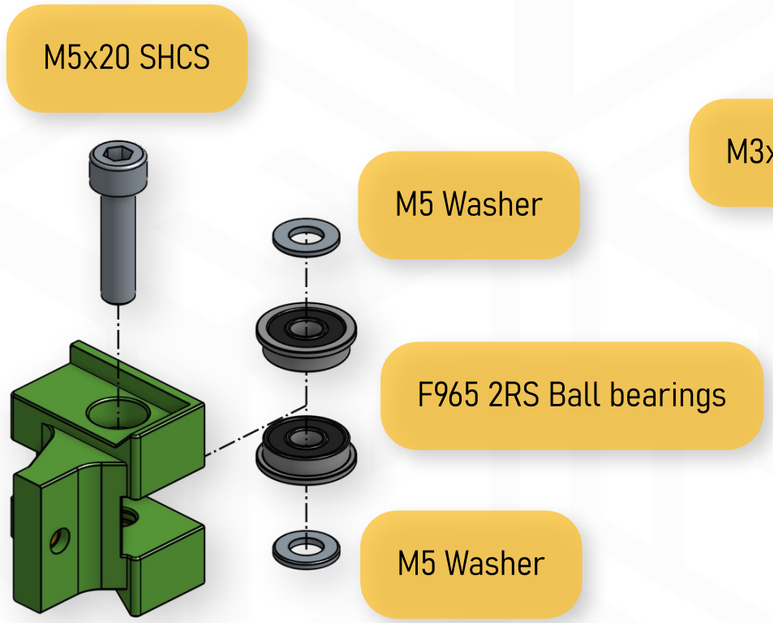
HARDWARE:

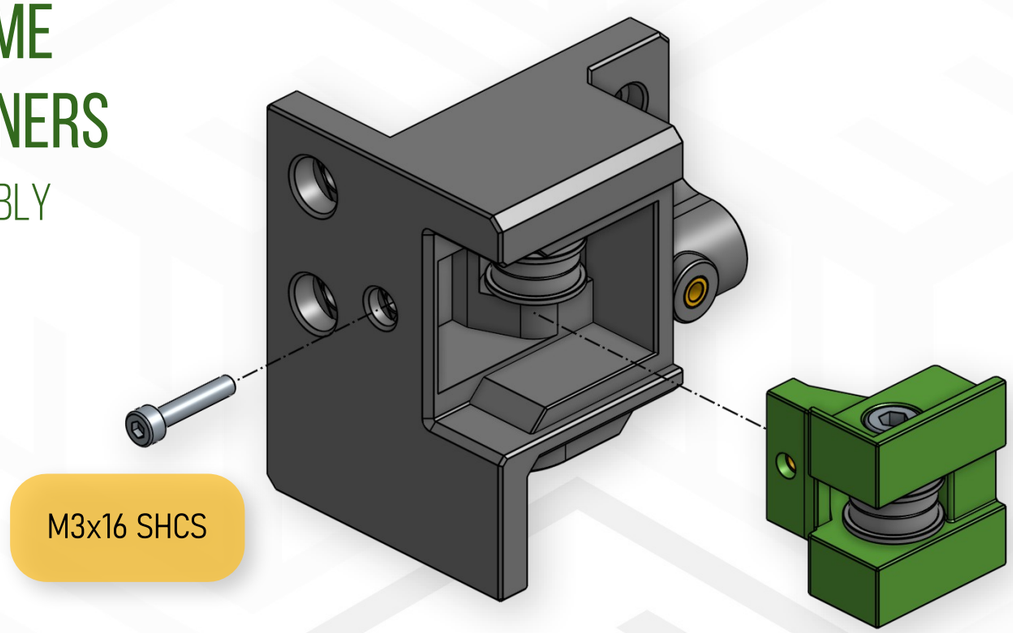
2x M3x5 setscrew
1x M3x16 SHCS
2x M4x8 SHCS
1x M5x20 SHCS
1x M5x25 SHCS

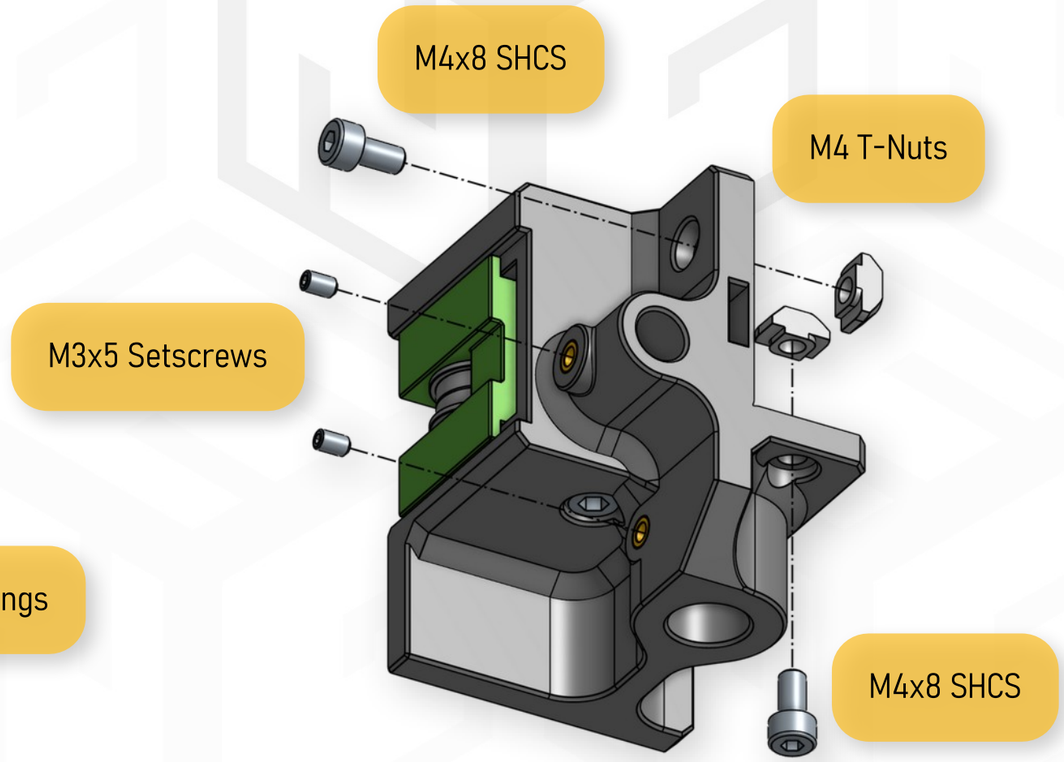
2x M4 T-Nut
4x M5 Washer

4x F695 2RS Ball bearing









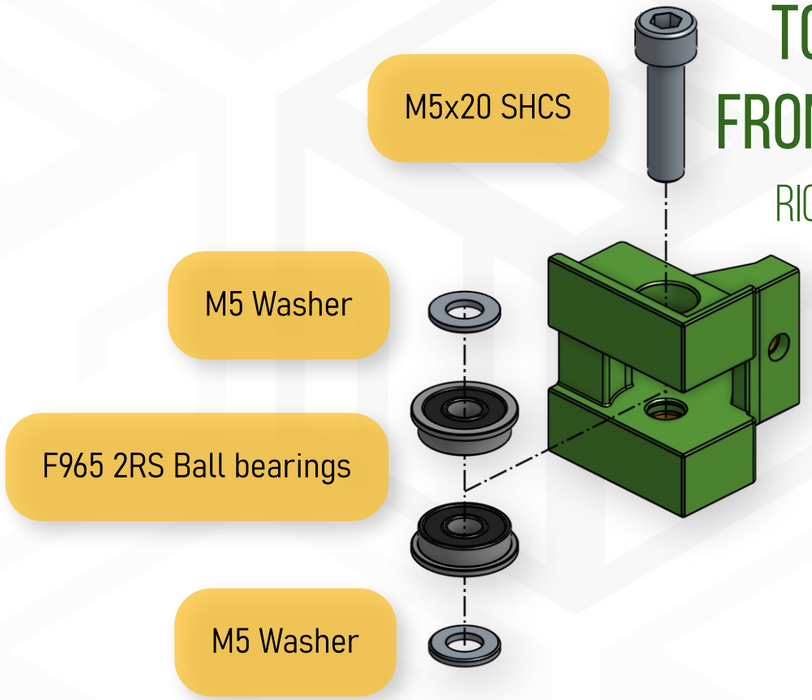
TOP FRAME
FRONT CORNERS
RIGHT ASSEMBLY

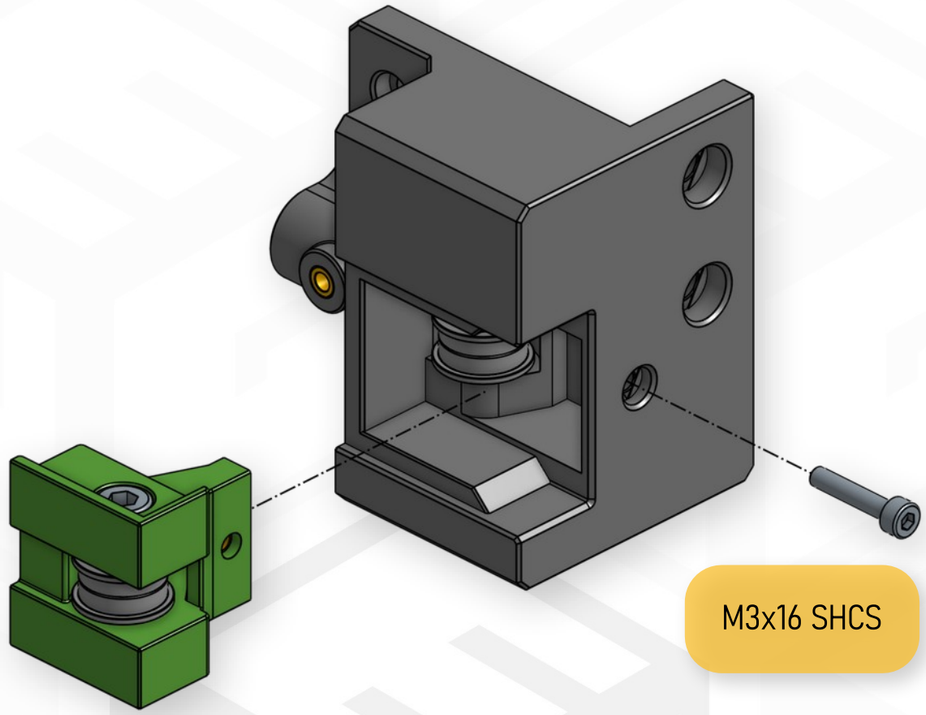
TOOLS:

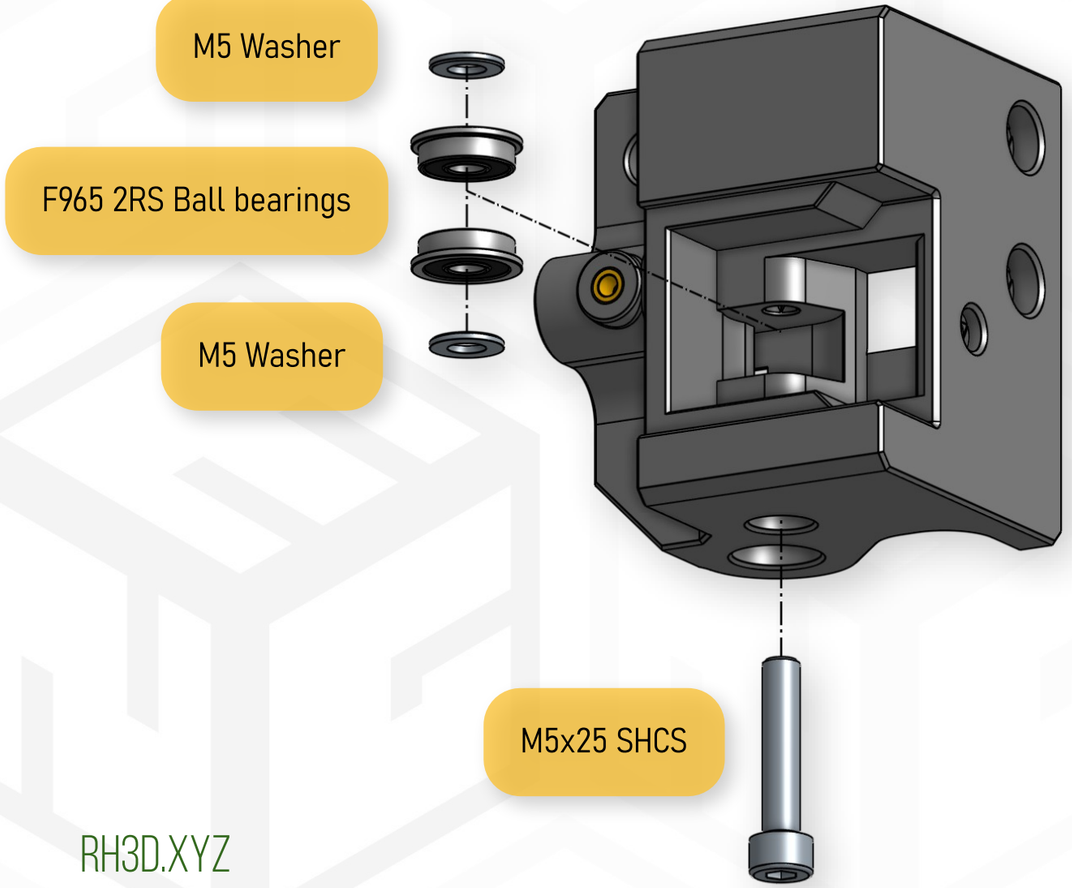
1.5 mm Allen key
2.5 mm Allen key
3 mm Allen key
4 mm Allen key

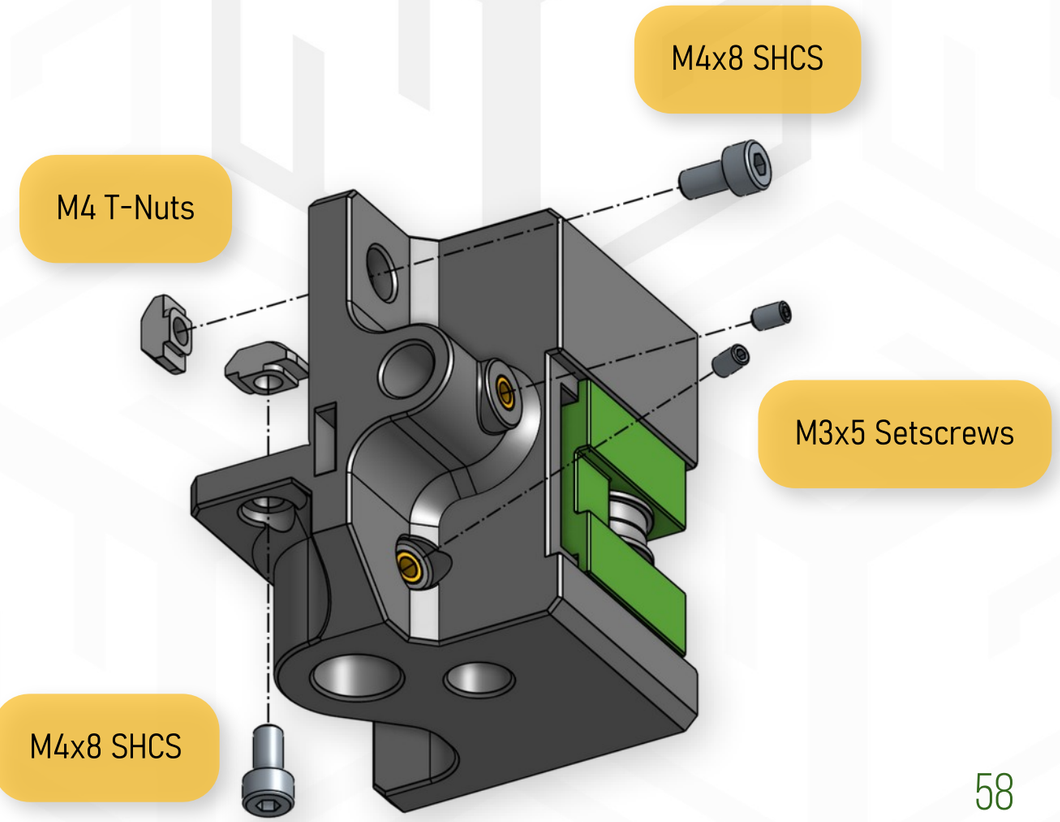
HARDWARE:

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
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

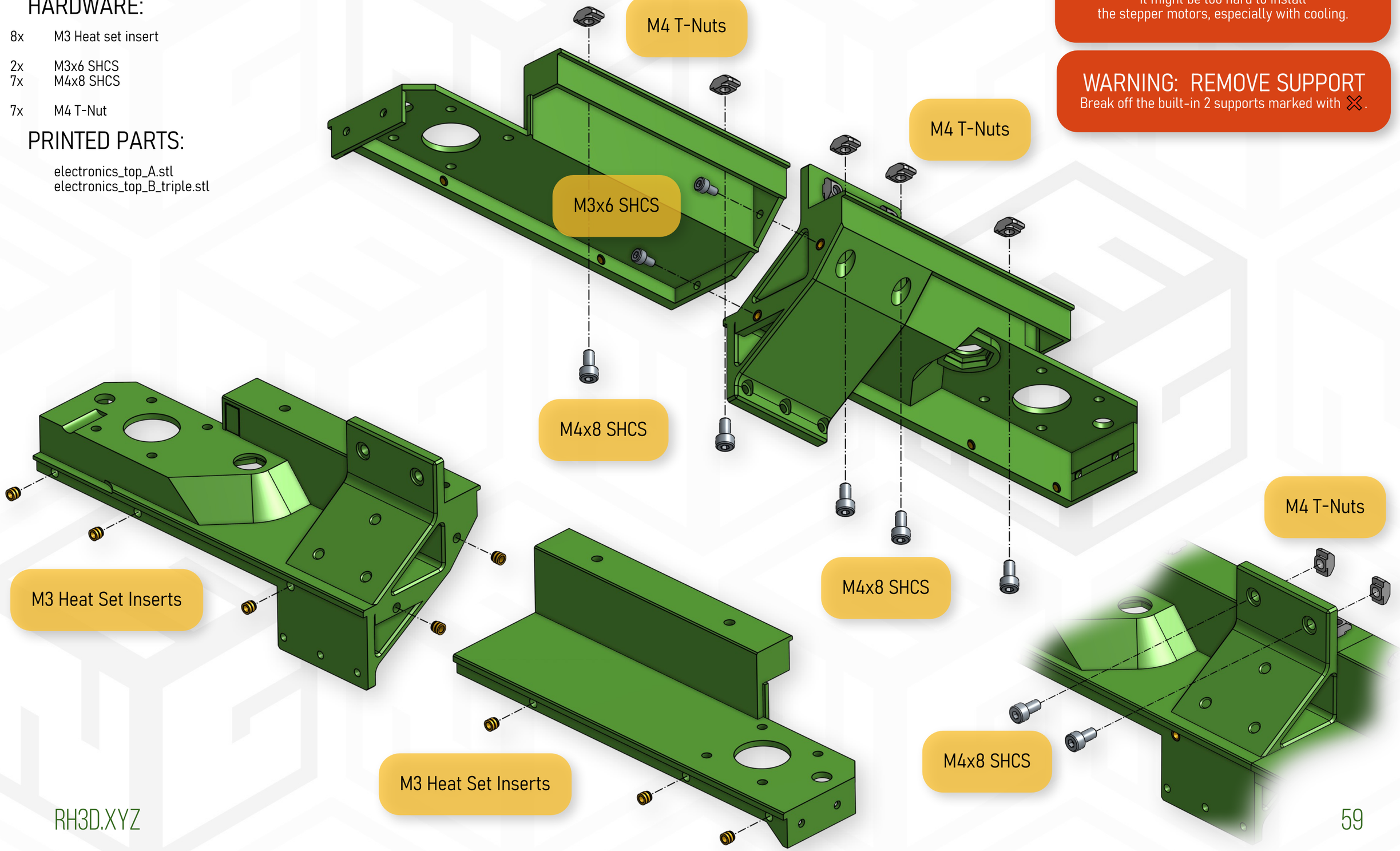
7x M4 T-Nut

PRINTED PARTS:

electronics_top_A.stl
electronics_top_B_triple.stl

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 ✕.



TOP FRAME
REAR COVER

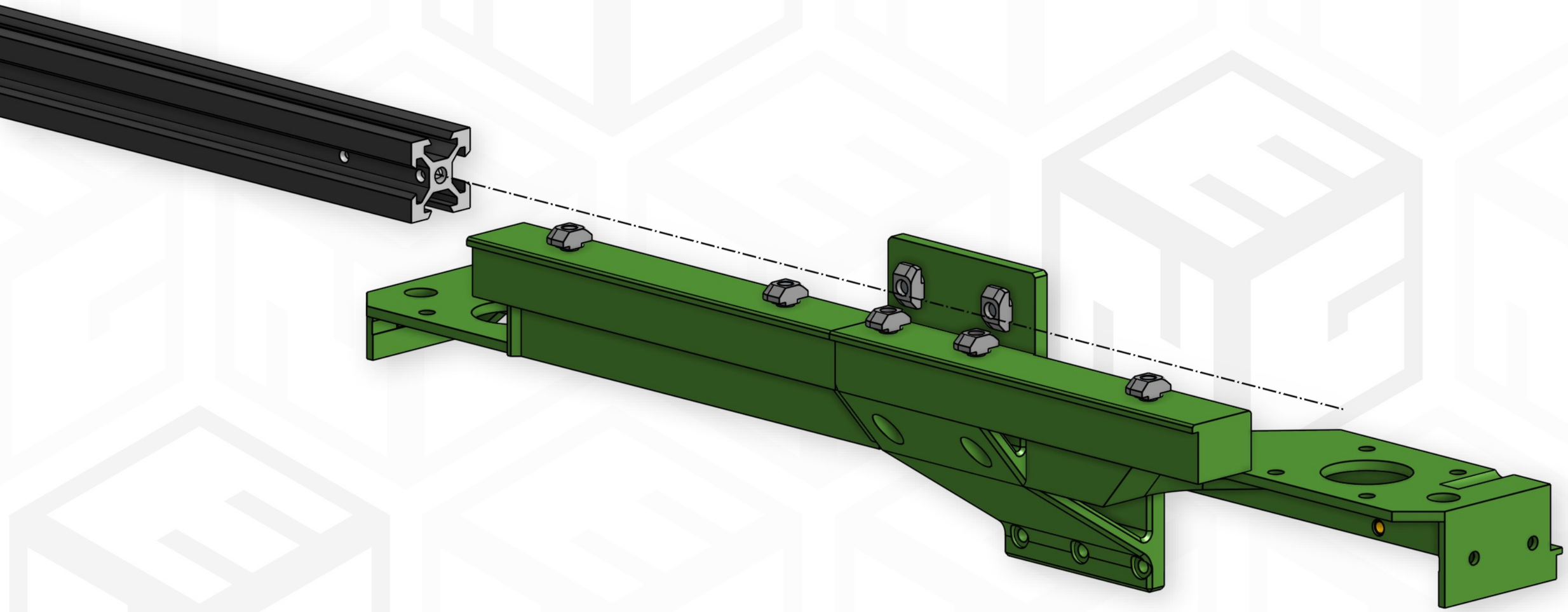
TOOLS:

3 mm Allen key

HARDWARE:

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

TIP: ORIENTATION
Orientation of the 2020 extrusion is not important.



TOP FRAME ASSEMBLY

TOOLS:

3 mm Allen key
4 mm Allen key

HARDWARE:

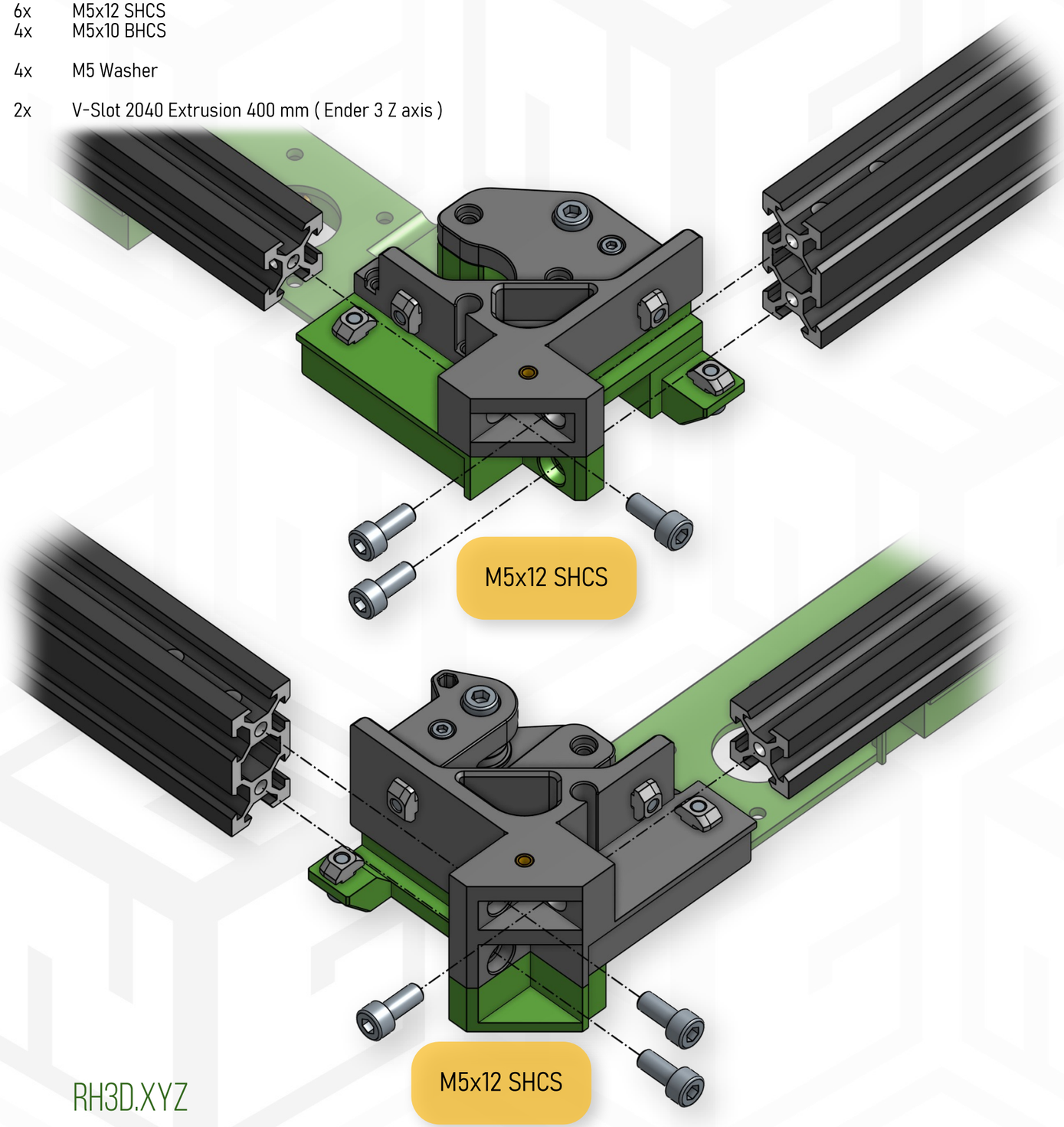
6x M5x12 SHCS
4x M5x10 BHCS

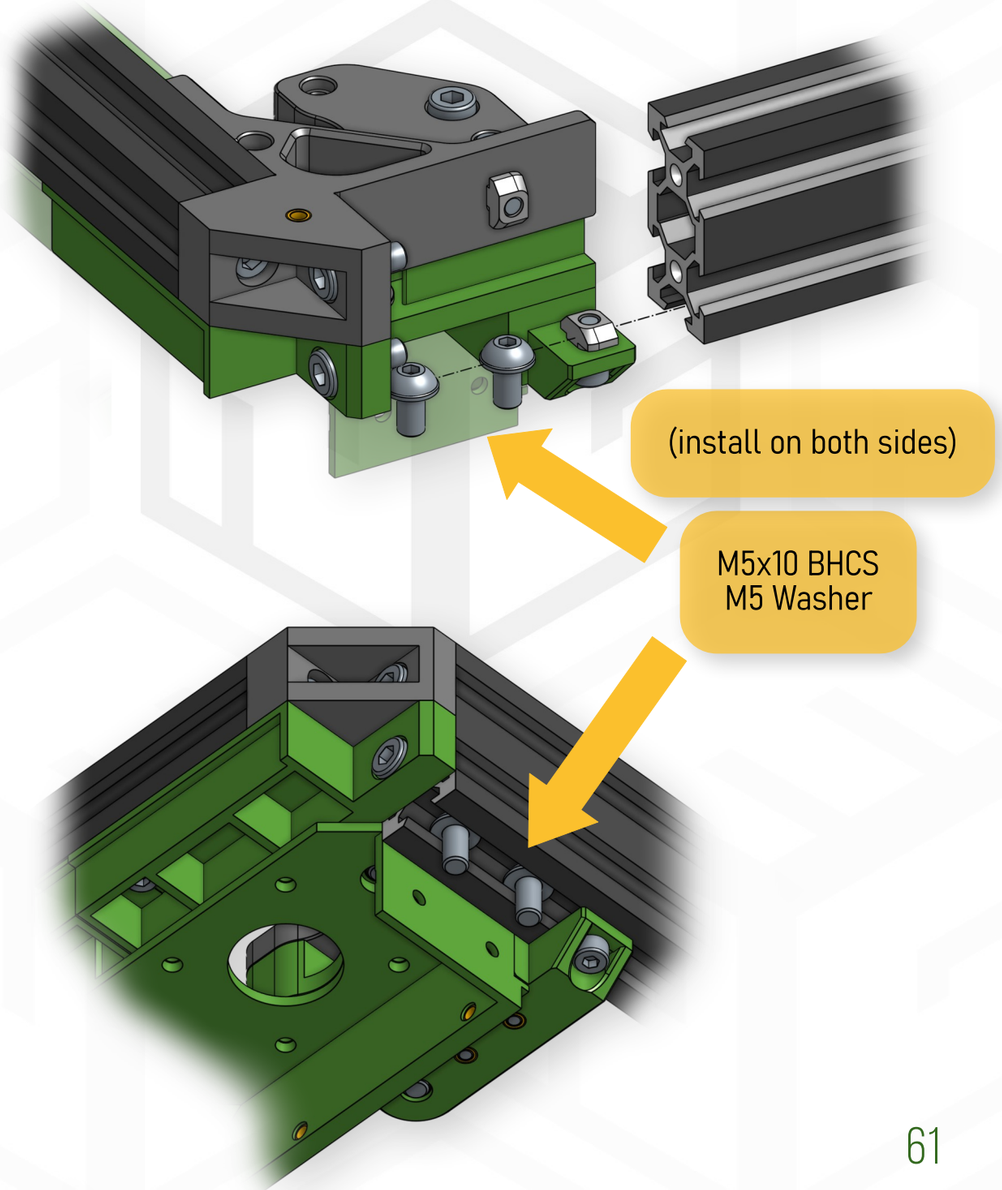
4x M5 Washer

2x V-Slot 2040 Extrusion 400 mm (Ender 3 Z axis)

WARNING: ORIENTATION
Keep the correct orientation of the 2040 extrusions to properly position drilled holes.

BHCS SCREWS
Insert two M5x10 BHCS and M5 washers on each side into the V-Slot as shown in the picture.
Do it on both sides.





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 (W1, W2, DA, DB) and adjusting the frame corner joints to get to the point where W1=W2 (~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 (A1, B1) and secondary (A2, B2) 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.

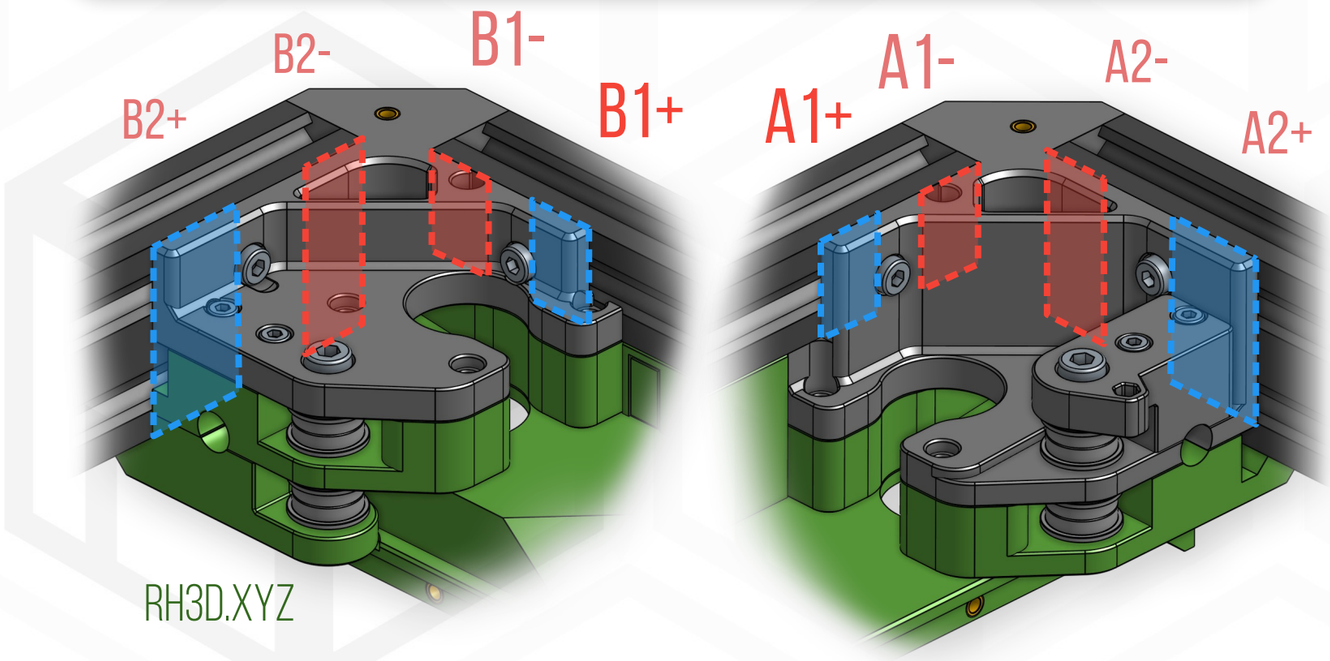
The top frame as is assembled in this step is still pretty flexible and it will reach it's maximum stiffness after installing stepper motors and after joining it with the bottom frame and attaching the electronics panel.

TIP: FLAT SURFACE

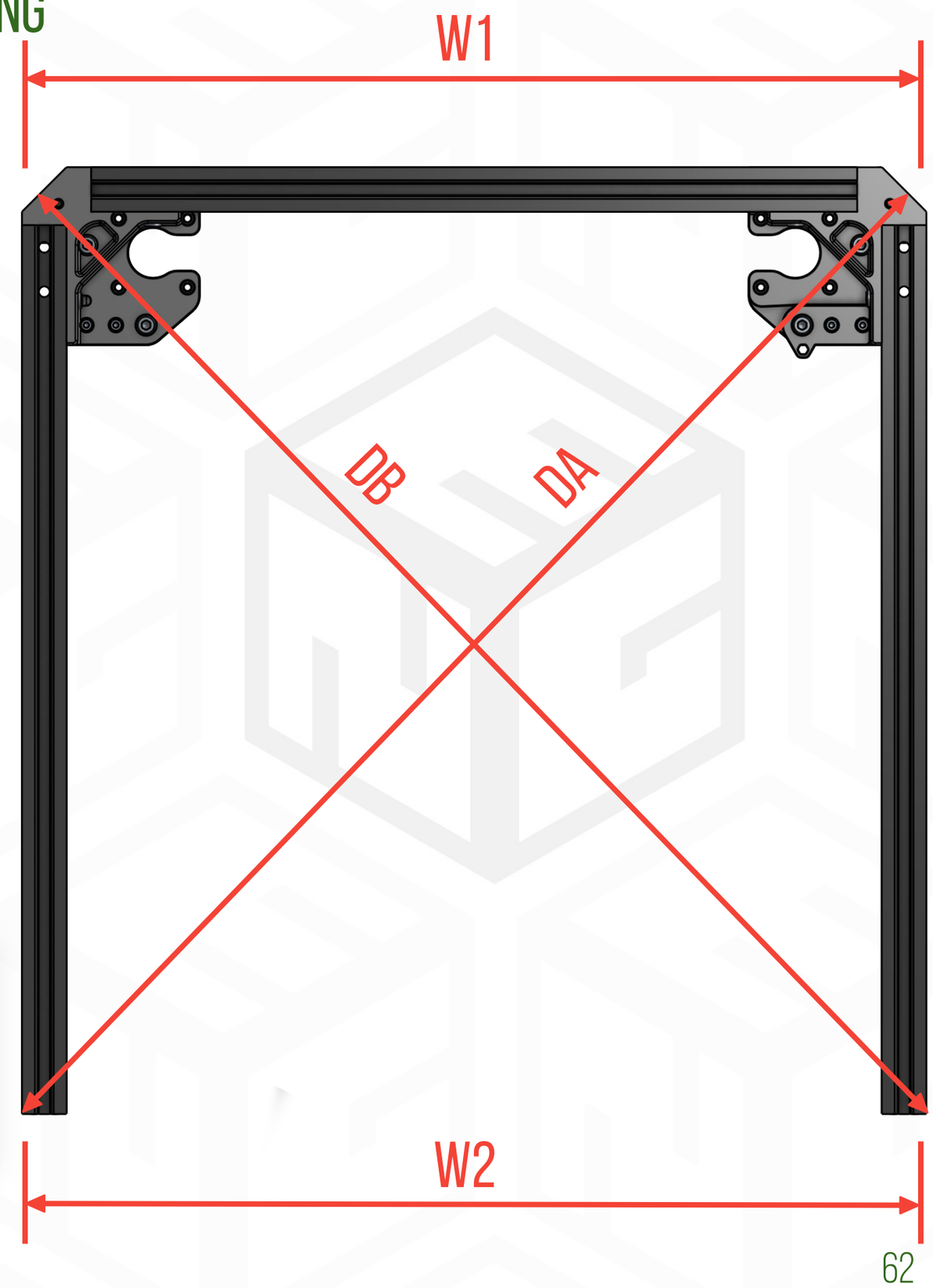
For measuring the dimensions, lay the frame upside down on a flat surface or support the 2040 extrusions on each end so you are sure the frame assembly is not twisted.

TIP: SHIM POSITIONS

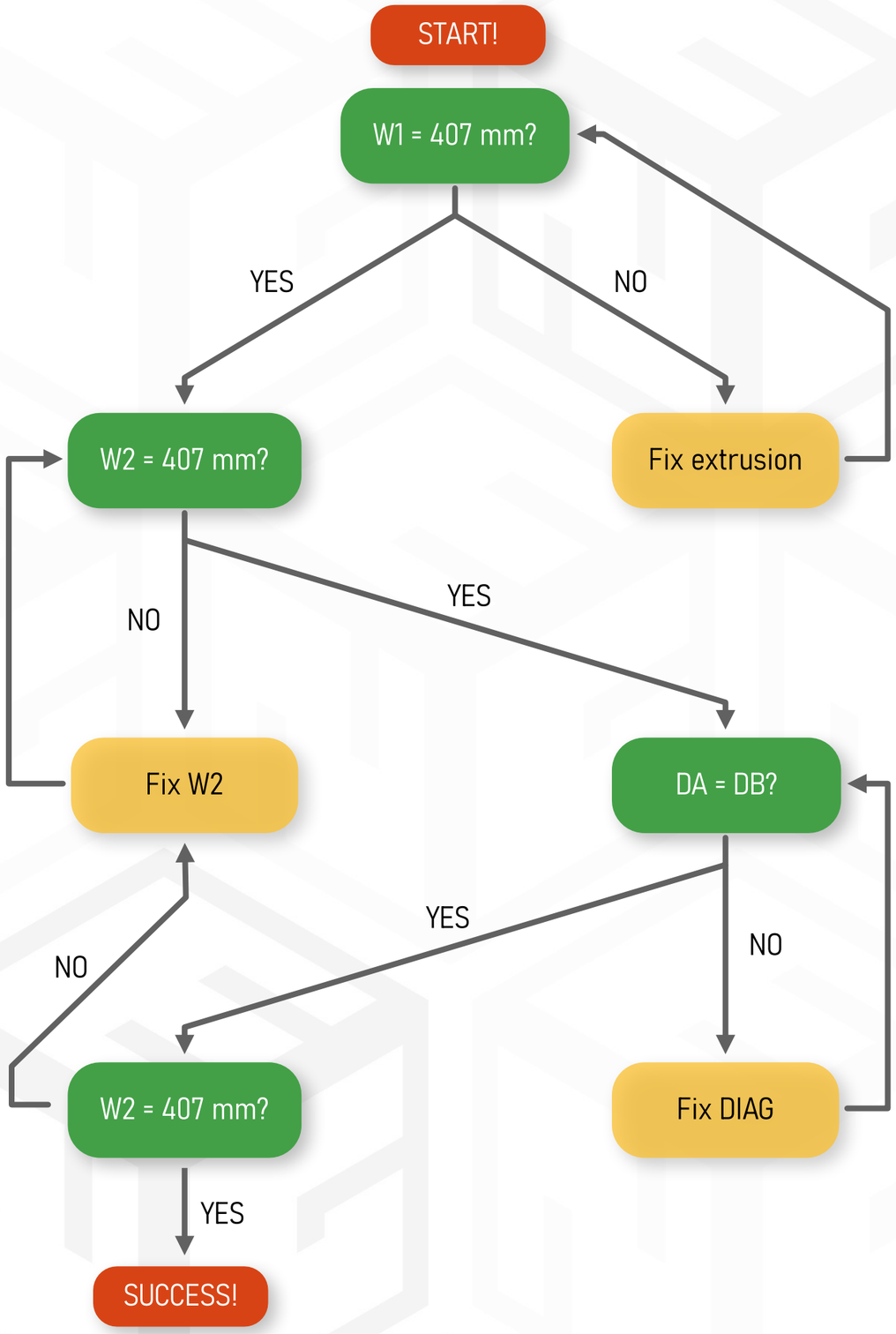
In majority of cases it is needed to only add shims to B1+ and A1+ positions so take that as your primary place to add shims and only if needed continue with other positions.

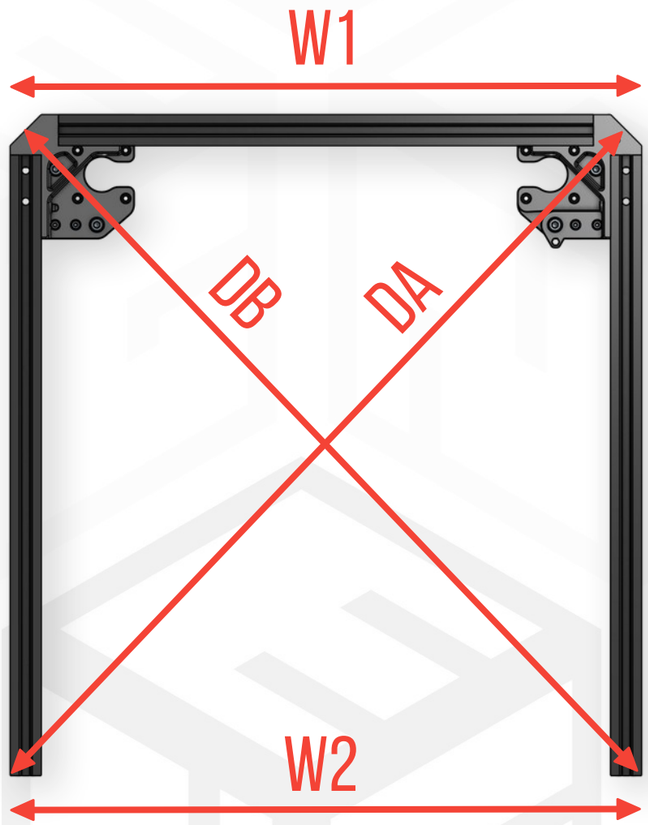


TOP FRAME SQUARING



TOP FRAME SQUARING





Fix extrusion

You didn't check the extrusion dimension before starting (follow page 6 or BOM).

Fix W2

- To increase W2, add shim to B1+ and A1+.
- To decrease W2, 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 neccessary, you can substitute 1 by 2 in the previous steps (eg. B1+ = B2+; A1- = A2-)

TOP FRAME ASSEMBLY

XY GANTRY

TOOLS:

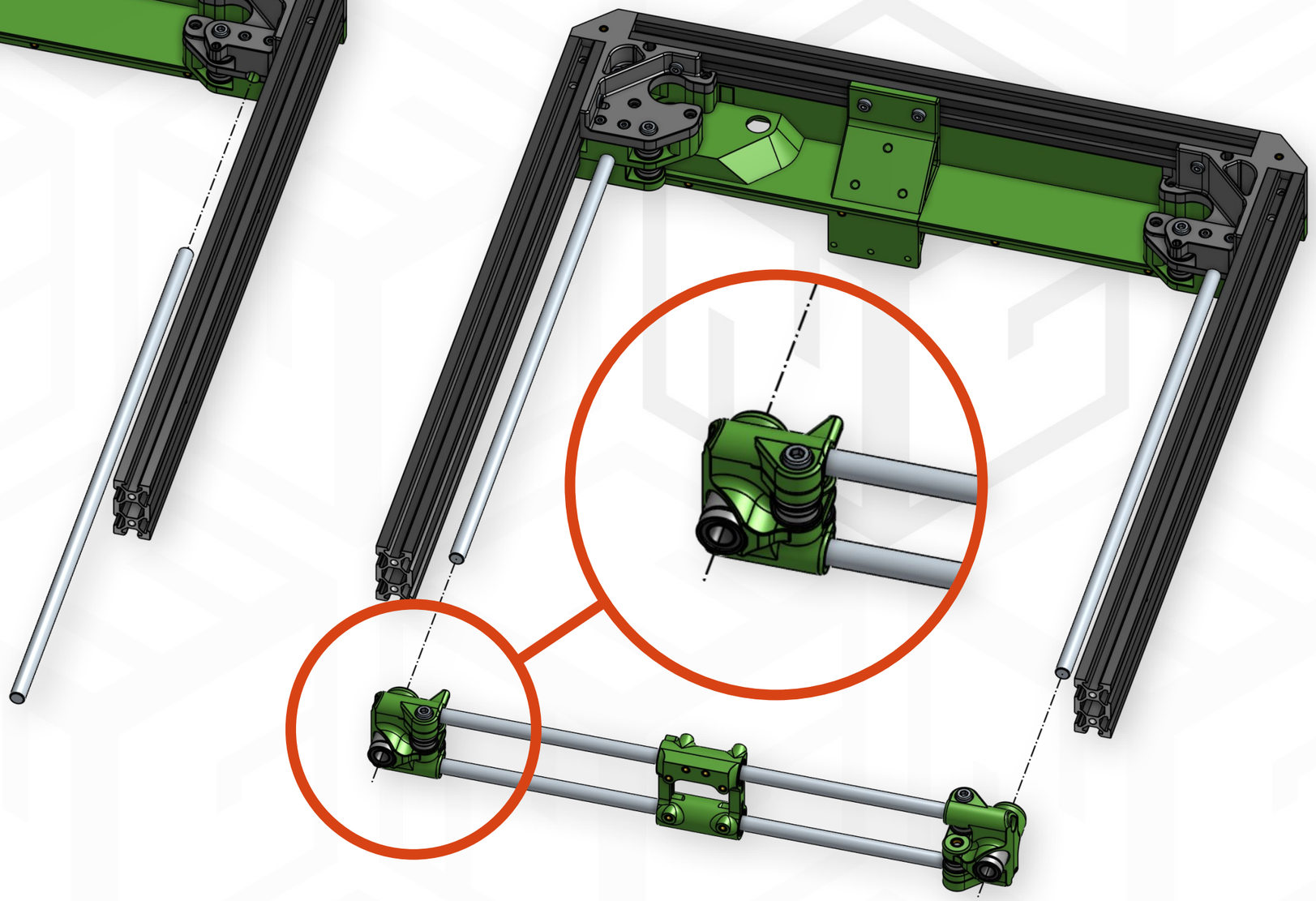
2.5 mm Allen key
4 mm Allen key

HARDWARE:

2x 8 x 350 mm Linear rod

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



TOP FRAME ASSEMBLY

TOOLS:

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

HARDWARE:

4x M5x12 SHCS

4x M5x20 BHCS
4x M5 Washer

BHCS SCREWS
Insert two M5x20 BHCS and M5 washers on each side into the V-Slot as shown in the picture.
Do it on both sides.

TOP FRAME ASSEMBLY

TOOLS:

4 mm Allen key

Ruler

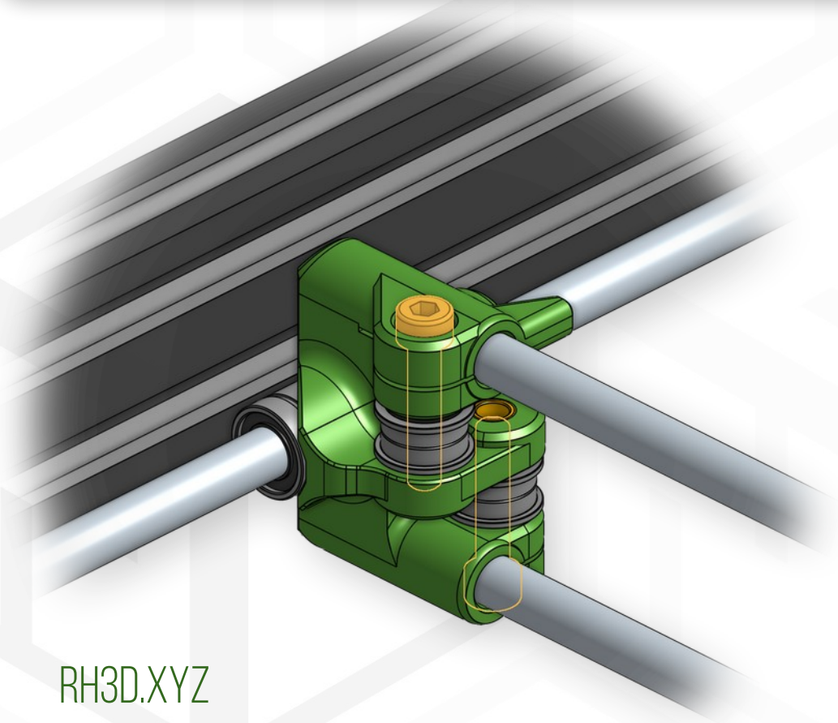
XY GANTRY ALIGNMENT

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:

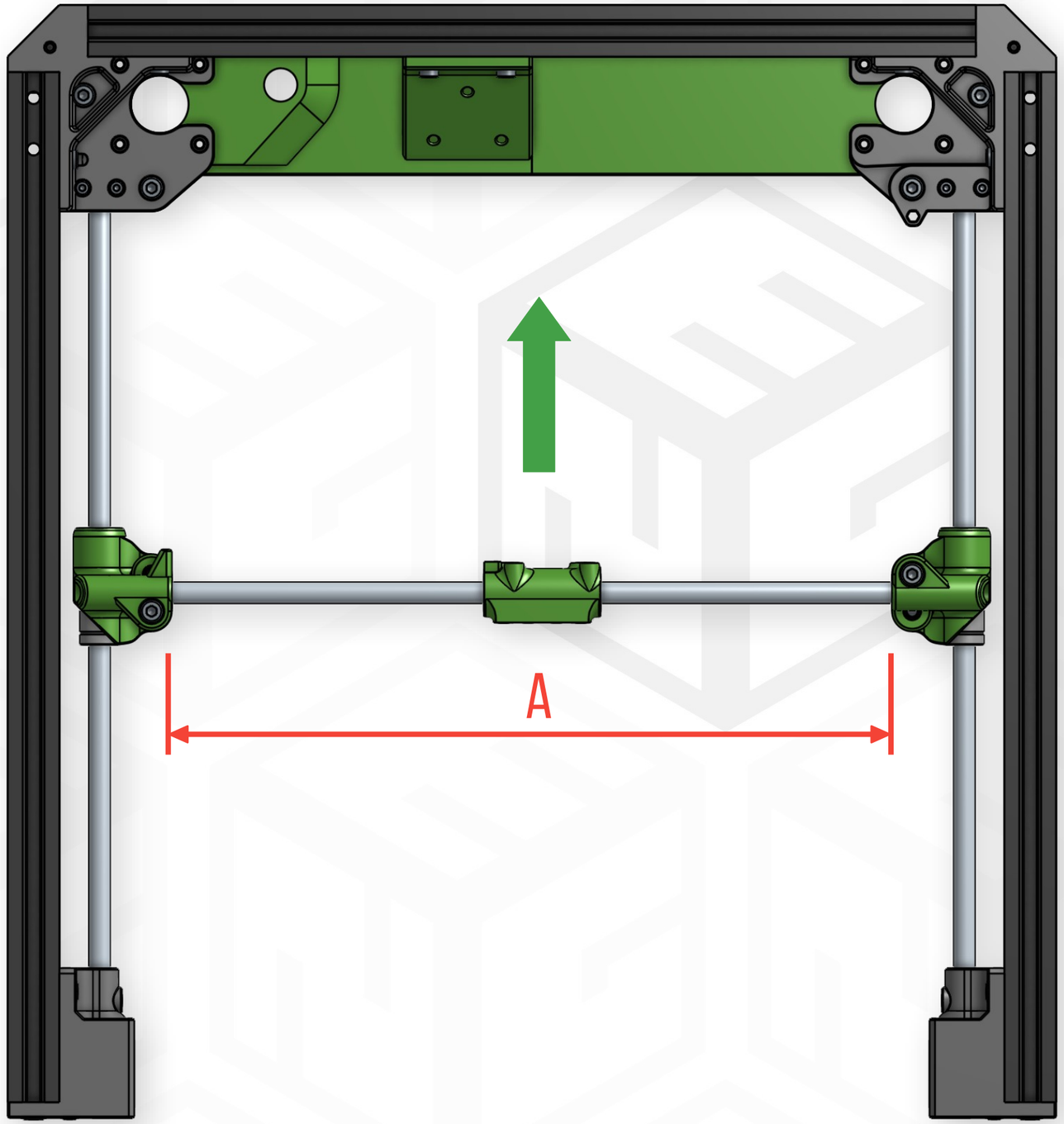
1) Make sure the M5 screws in the Y gantry blocks are loose.
2) Verify the 8mm X axis rods are sliding in the Y gantry blocks reasonably easily.
3) Check the Y axis rods and make sure they are secured properly without noticeable play.
4) Move the gantry to the rear end. (Y max)
5) Adjust the spacing (A) between Y gantry blocks if it doesn't on its own, so the gantry is moving 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 restistance.



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)

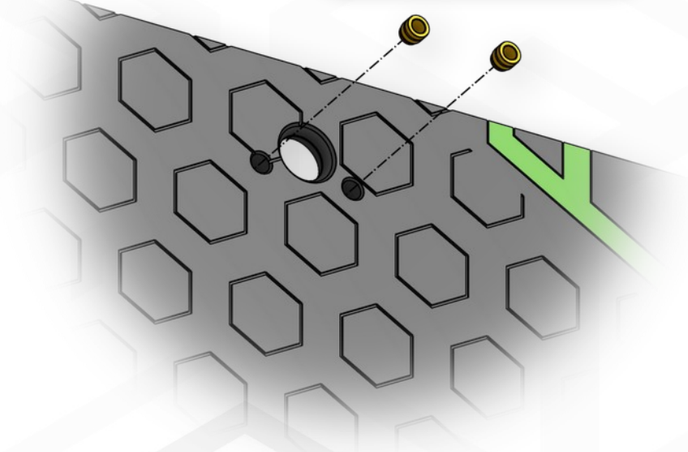
HARDWARE:

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

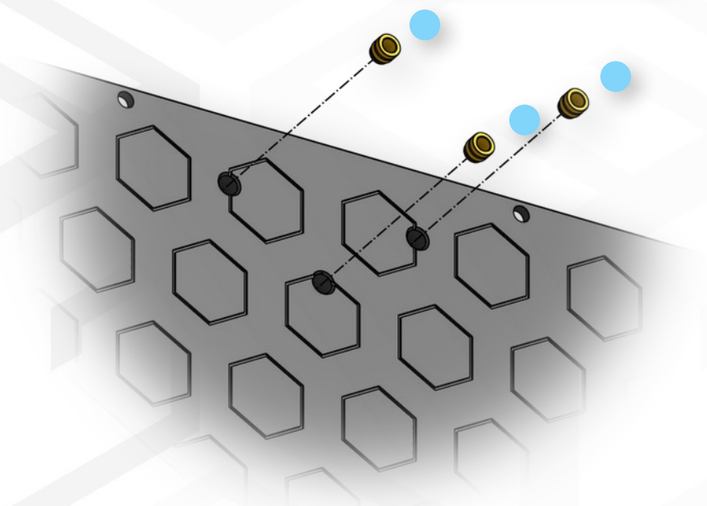
PRINTED PARTS:

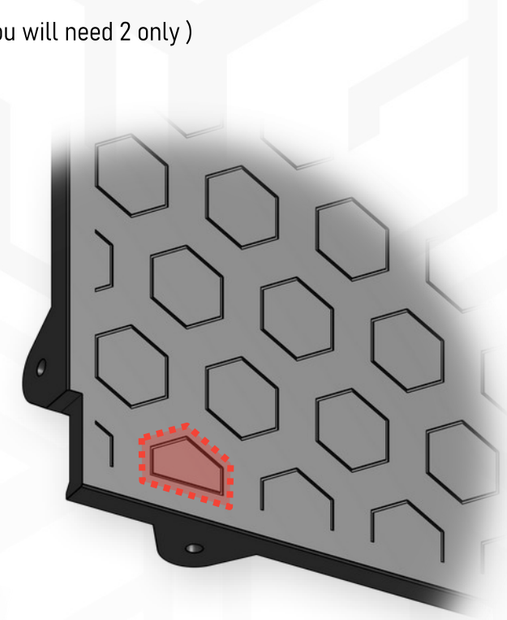
electronics_panel_lower_left.stl
electronics_panel_lower_right.stl
electronics_panel_upper_left.stl
electronics_panel_upper_right.stl

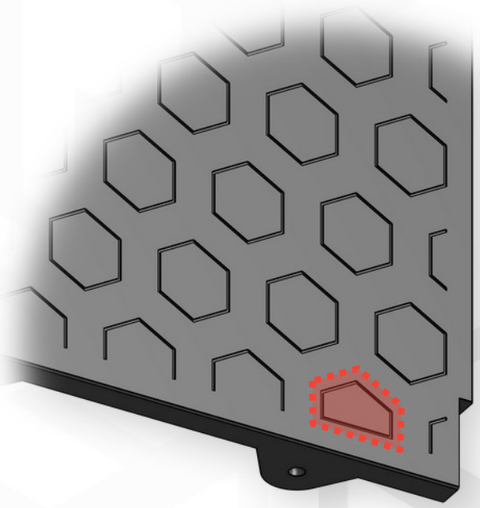
M3 Heat Set Inserts

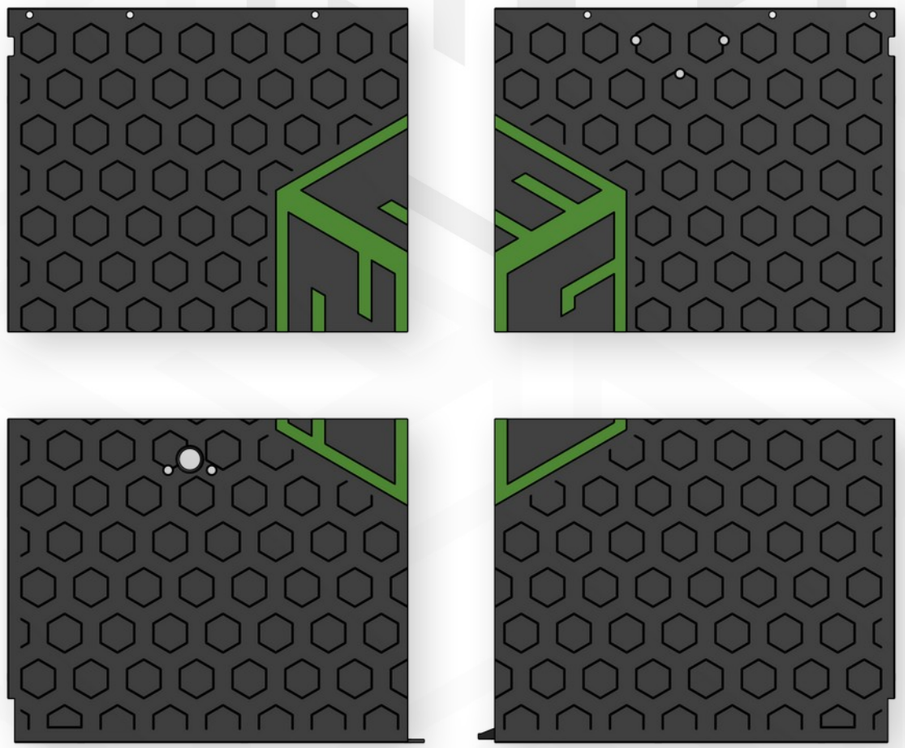


M3 Heat Set Inserts









NOTE: WIRING HOLES CUTOUT

Look for the half hexagons at the bottom side corners and cut them out.
Clean the hole following the edge of the half-hex.

For the standard setup, cut only the right hole.

If you plan to upgrade to aux fans or 3x Z steppers It is easier to cut holes on both sides now.

TIP: KLICKY PROBE

Marked heat inserts are used for Klicky and KlickyPCB probe dock. If you will use other probe, you dont 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
2x electronics_panel_glue_strip_middle.stl

NOTE: GLUING PANELS

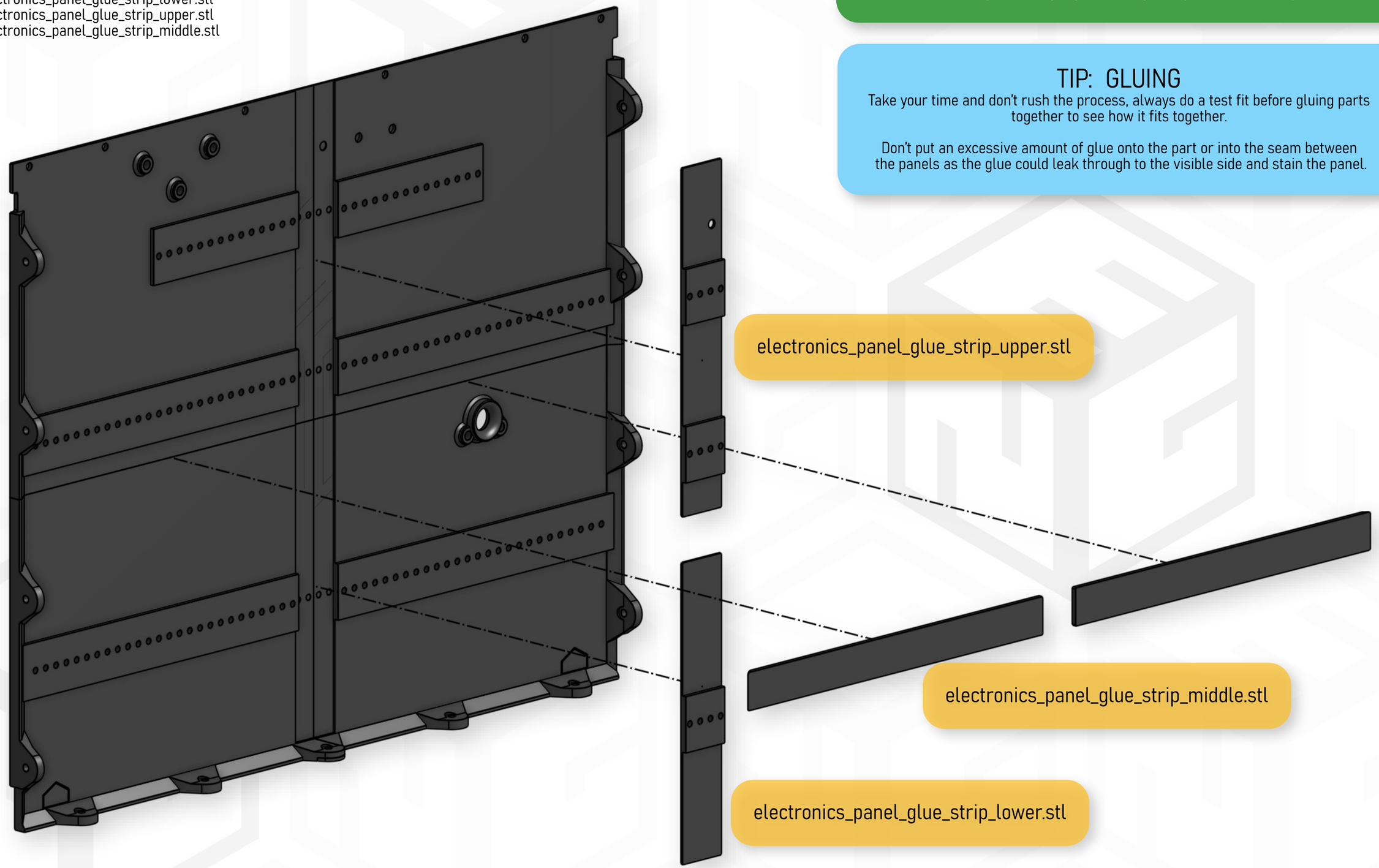
Put the panel logo side on a flat surface and glue it together using the glue strips starting with the vertical ones and following with the horizontal ones.

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:

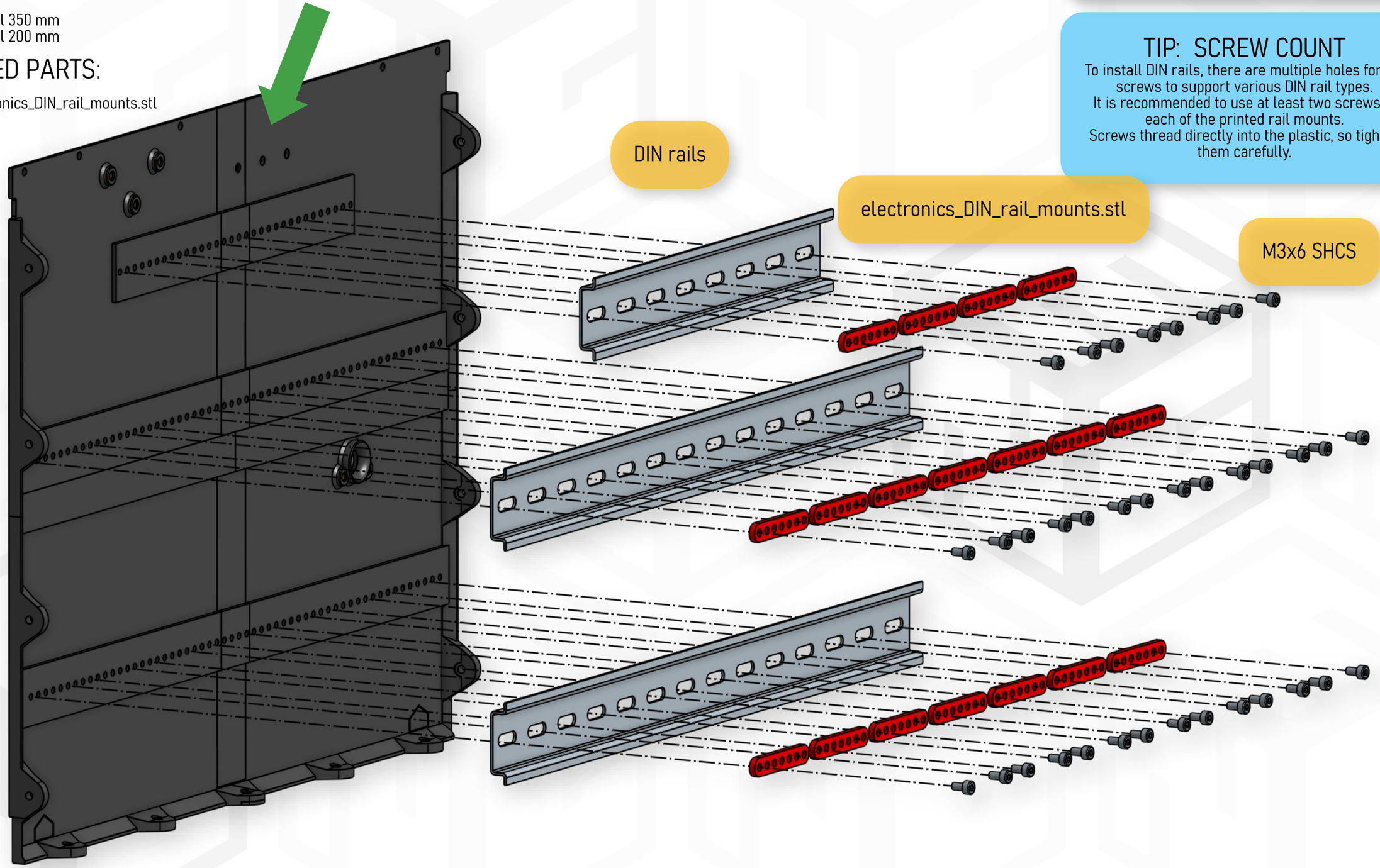
18x electronics_DIN_rail_mounts.stl

3 Z AXIS RODS

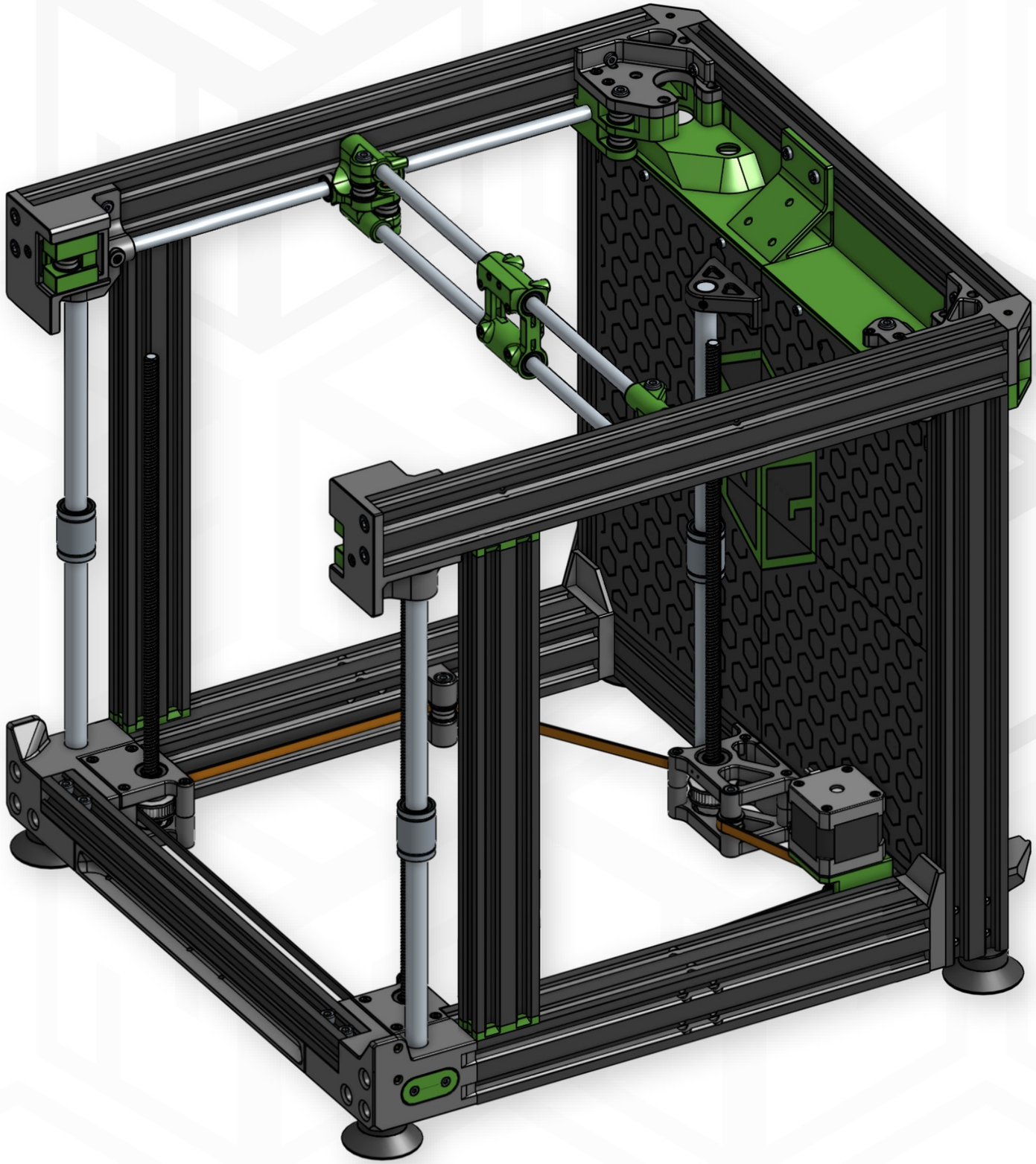
For securing the third Z axis rod, drill through the 3 marked holes with a 4 mm drill bit.

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.



FRAME ASSEMBLY



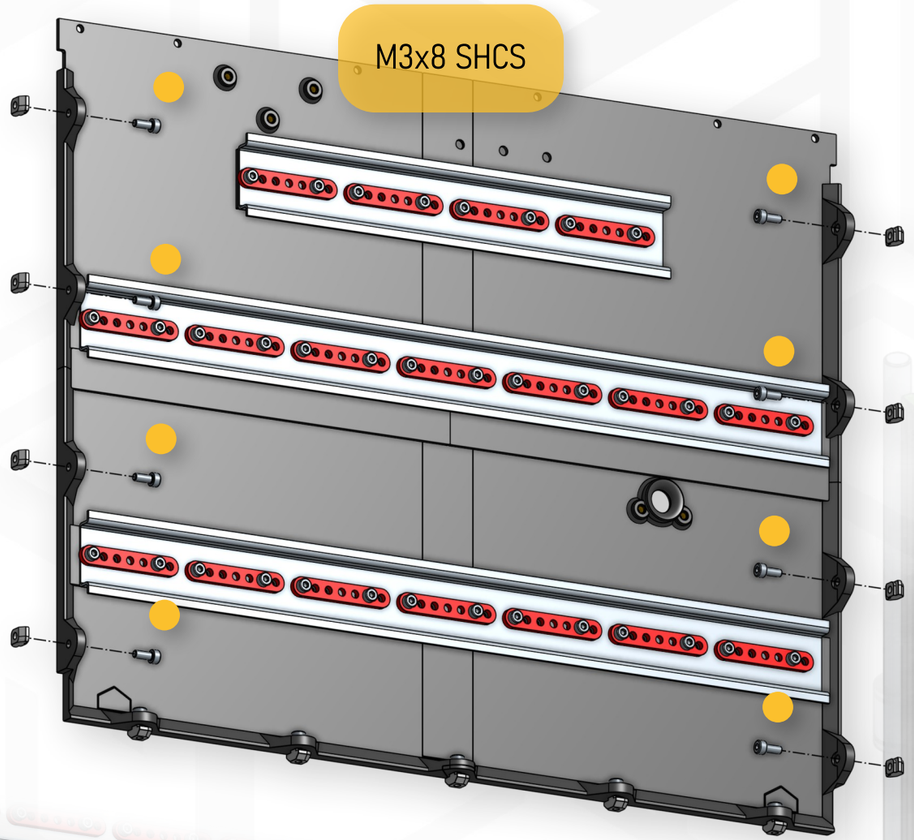
FRAME ASSEMBLY
PANEL INSTALL

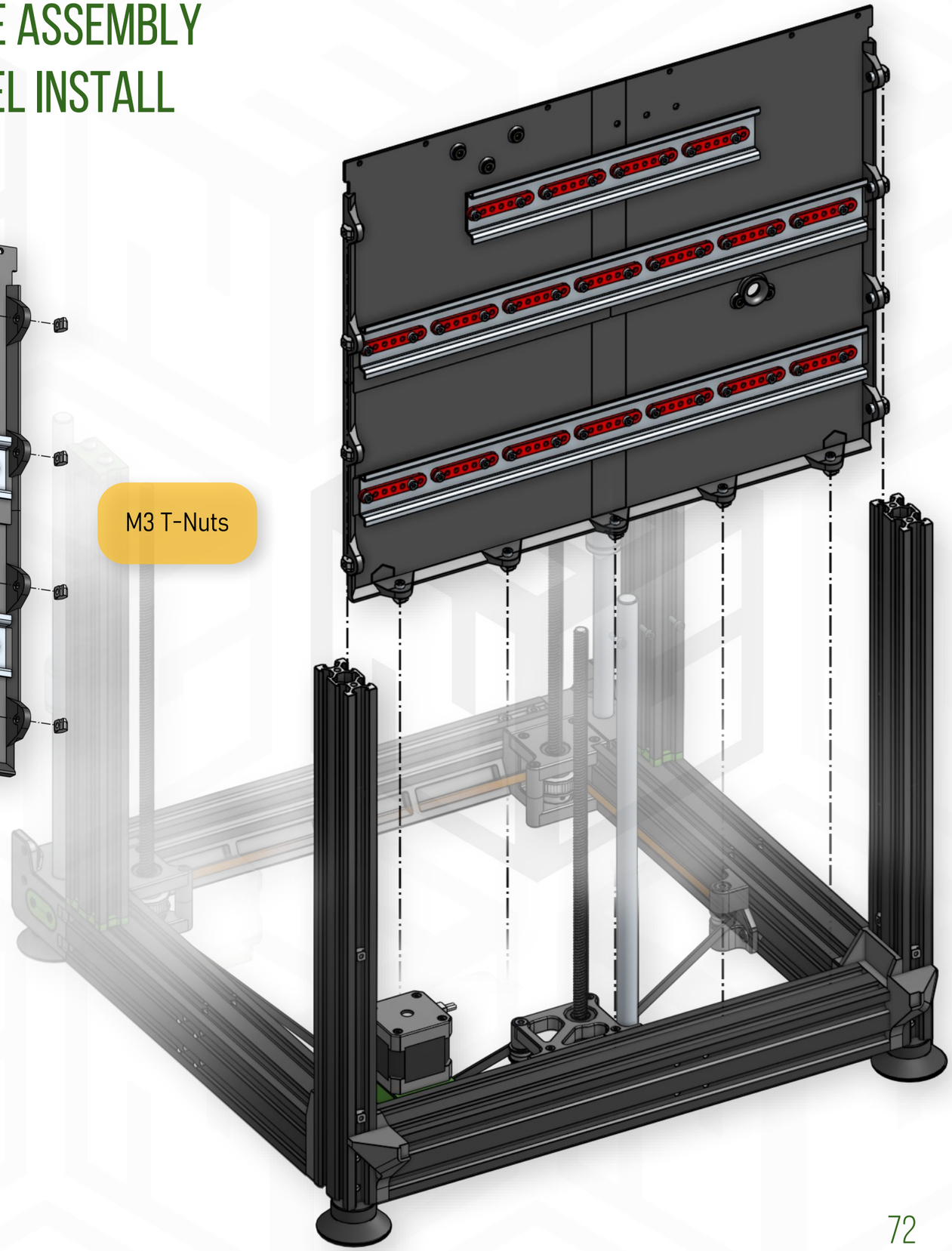
TOOLS:

2.5 mm Allen key

HARDWARE:

13x M3x8 SHCS
13x M3 T-Nut





FRAME ASSEMBLY
TOP FRAME INSTALL

TOOLS:

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

HARDWARE:

10x M3x6 SHCS
4x M3 T-Nut

PRINTED PARTS:

2x frame_optional_2040_spacer_5mm.stl
(= both sides)

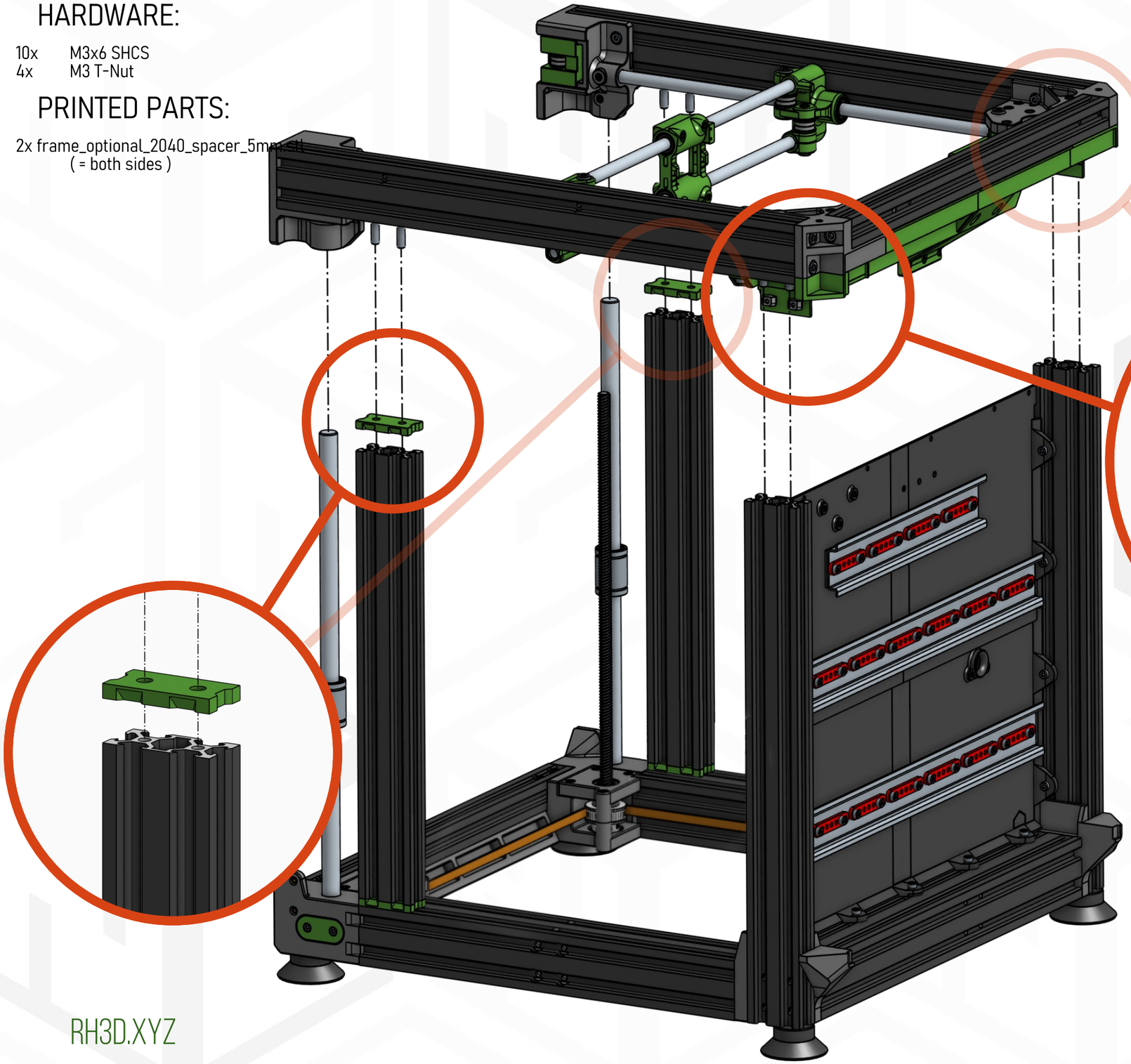
TIP: BED CARRIAGE

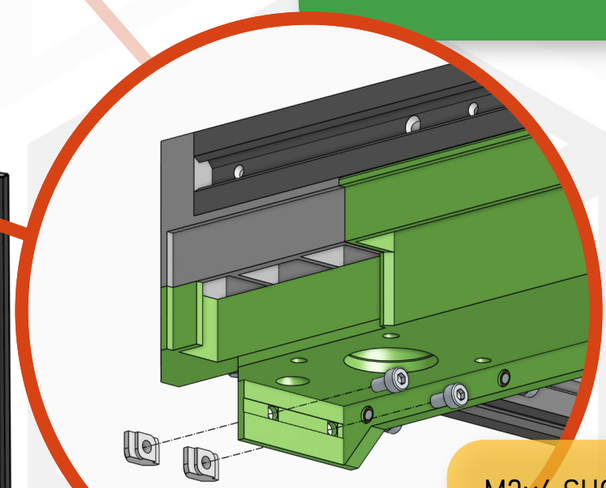
Usually, we would install the bed carriage before this step for a simpler process and you can do so without issues. In that case, follow the bed assembly in pages 76-82 and then come back.

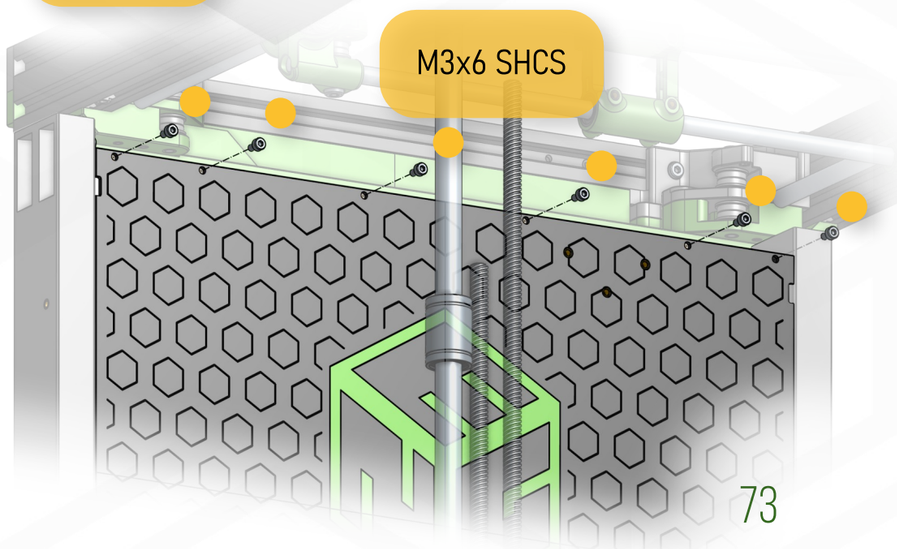
This guide installs the bed after the frame is assembled to show the process of doing it in case you need to take the bed carriage out some day.

NOTE: SYMMETRY

Preinstall the required M3x6 SHCS with M3 T-Nuts and 2040 V-slot extrusion spacers!







FRAME ASSEMBLY
3RD Z ROD MOUNT

TOOLS:

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

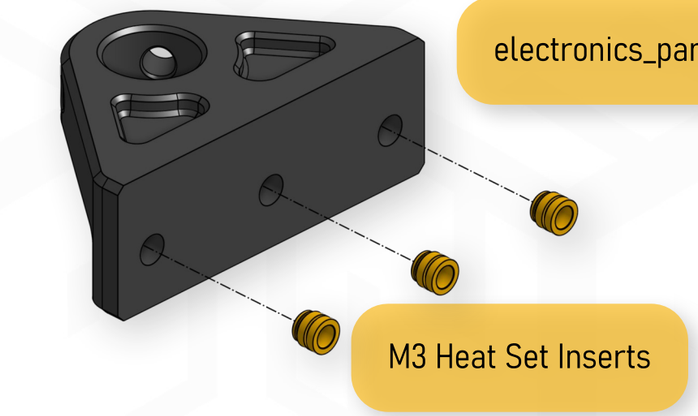
HARDWARE:

3x M3x10 SHCS
2x M3x5 setscrew

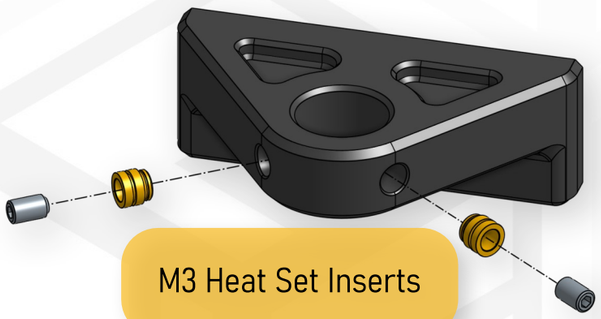
5x M3 Heat insert

PRINTED PARTS:

electronics_panel_rod_mount.stl

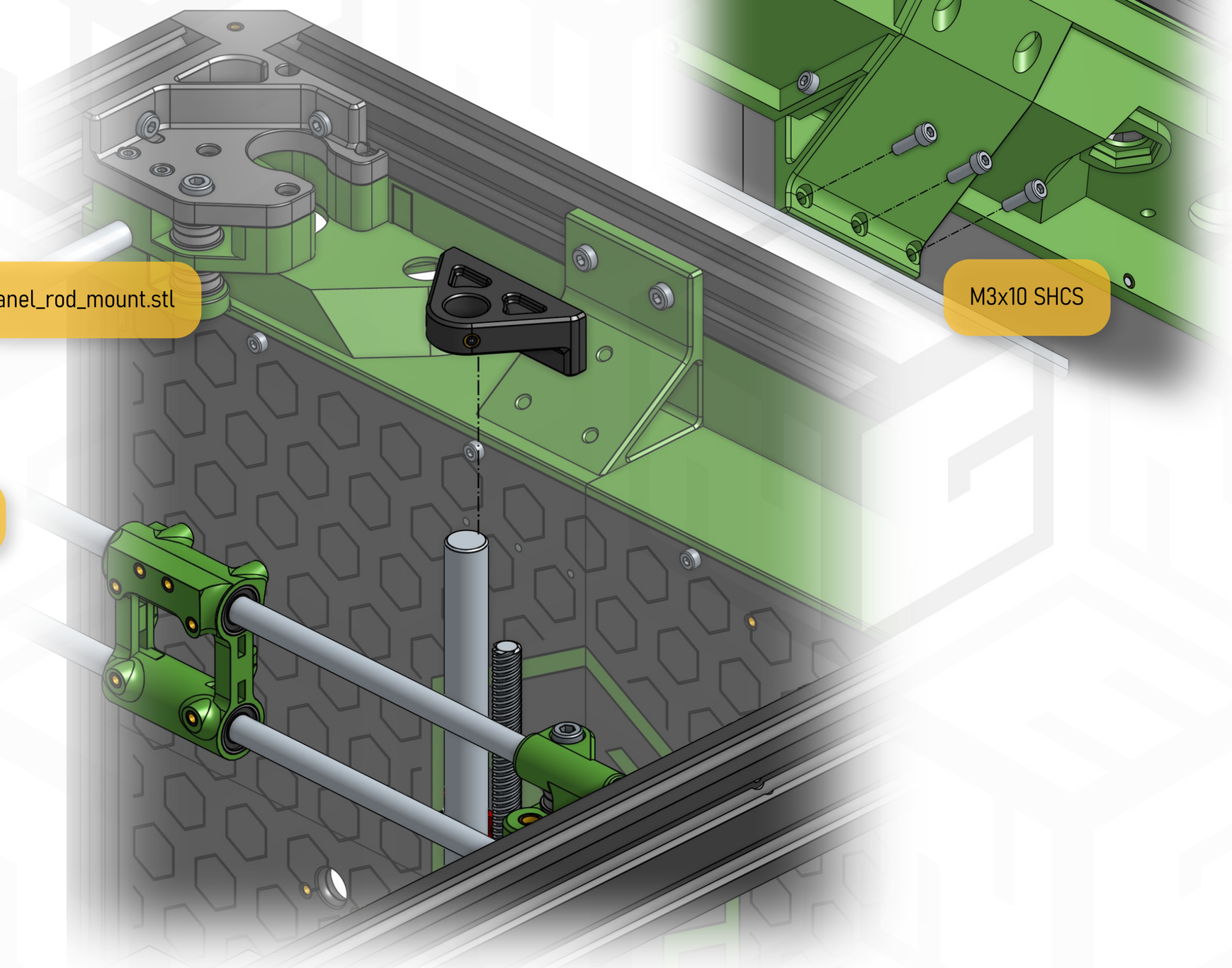


M3 Heat Set Inserts



M3 Heat Set Inserts

M3x5 Setscrews



electronics_panel_rod_mount.stl

M3x10 SHCS

AB STEPPER MOTORS INSTALL

TOOLS:

1.5 mm Allen key
2.5 mm Allen key
Ruler

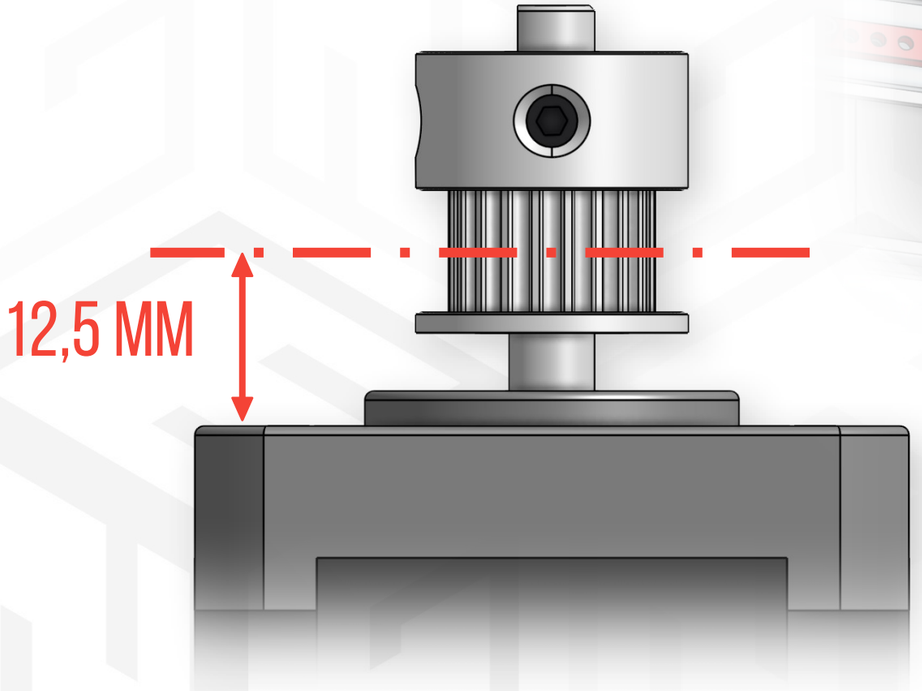
HARDWARE:

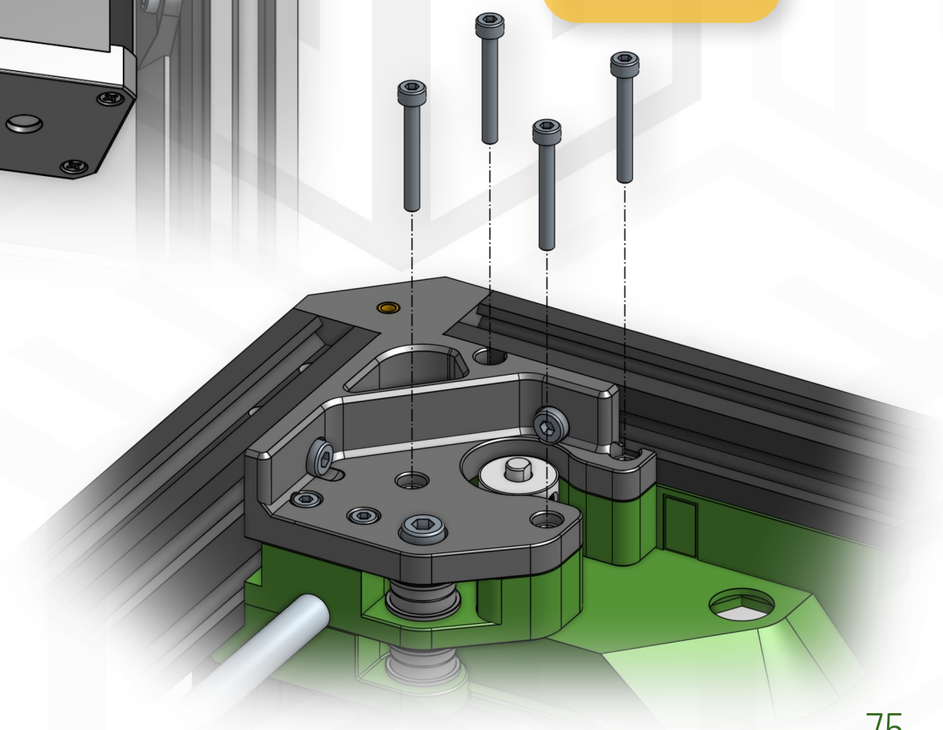
8x M3x25 SHCS (= both sides)

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.





BED CARRIAGE

BED CARRIAGE ARMS

HEAT SET INSERTS / NUTS INSTALL

TOOLS:

Heat set insert press

HARDWARE:

12x M3 Heat insert

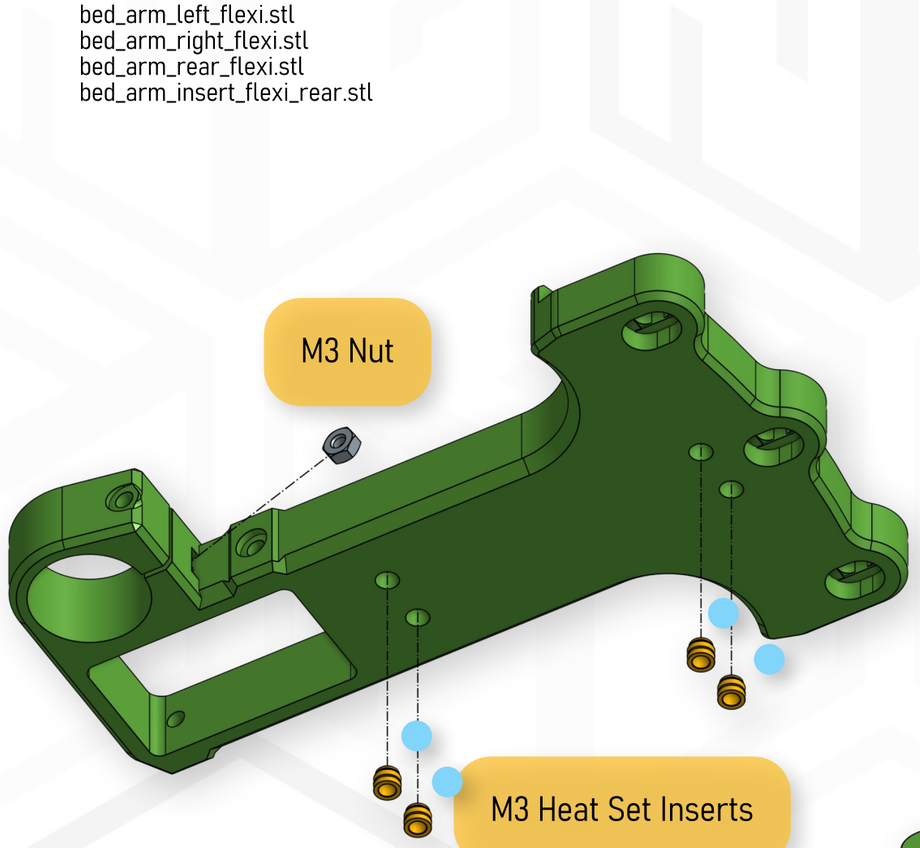
5x M3 Nut

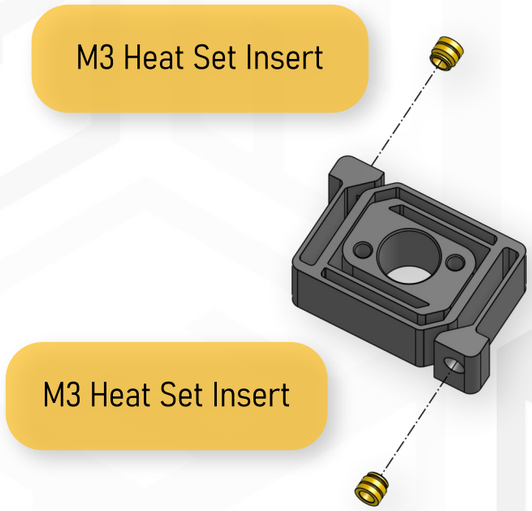
PRINTED PARTS:

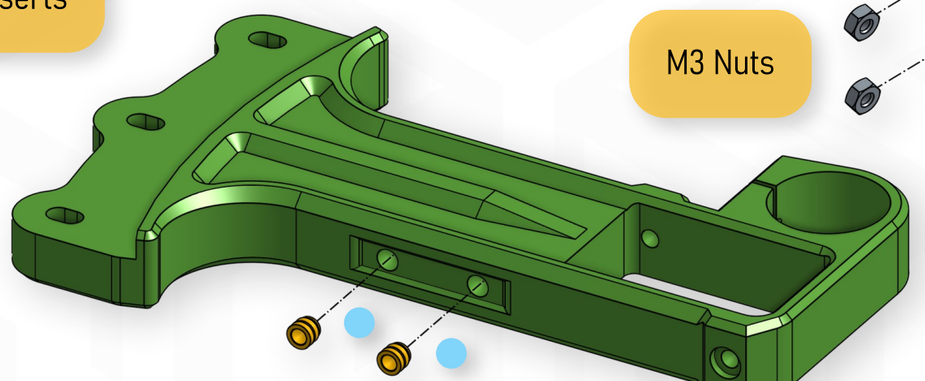
bed_arm_left_flexi.stl
bed_arm_right_flexi.stl
bed_arm_rear_flexi.stl
bed_arm_insert_flexi_rear.stl

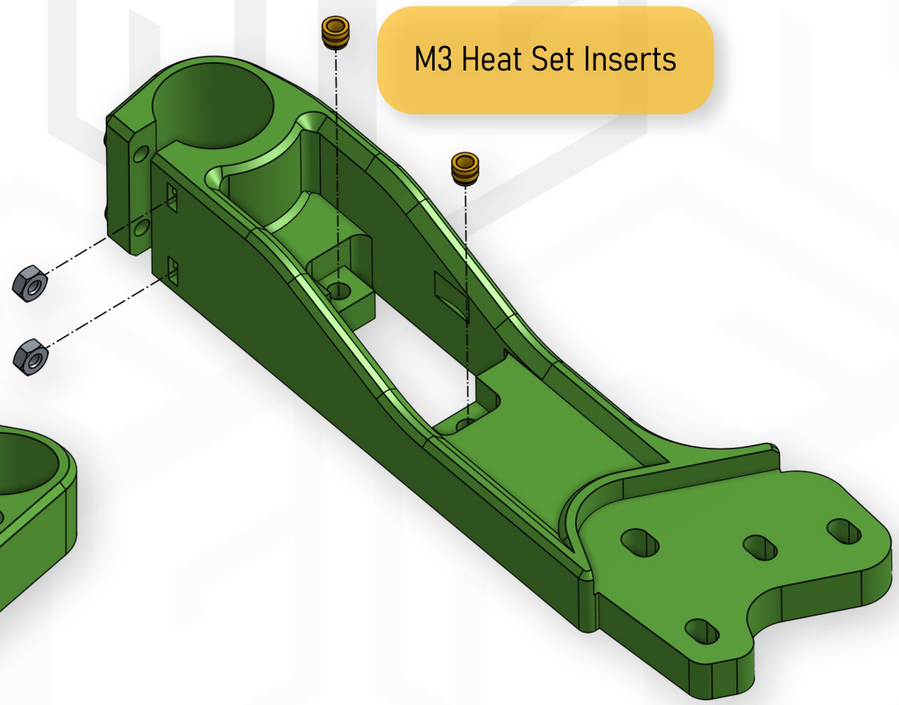
NOTE: SYMMETRY
Left and right sides are symmetrical. Do the same steps for the right bed arm.

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.









BED CARRIAGE INSTALL

FRONT ARMS

TOOLS:

2.5 mm Allen key

HARDWARE:

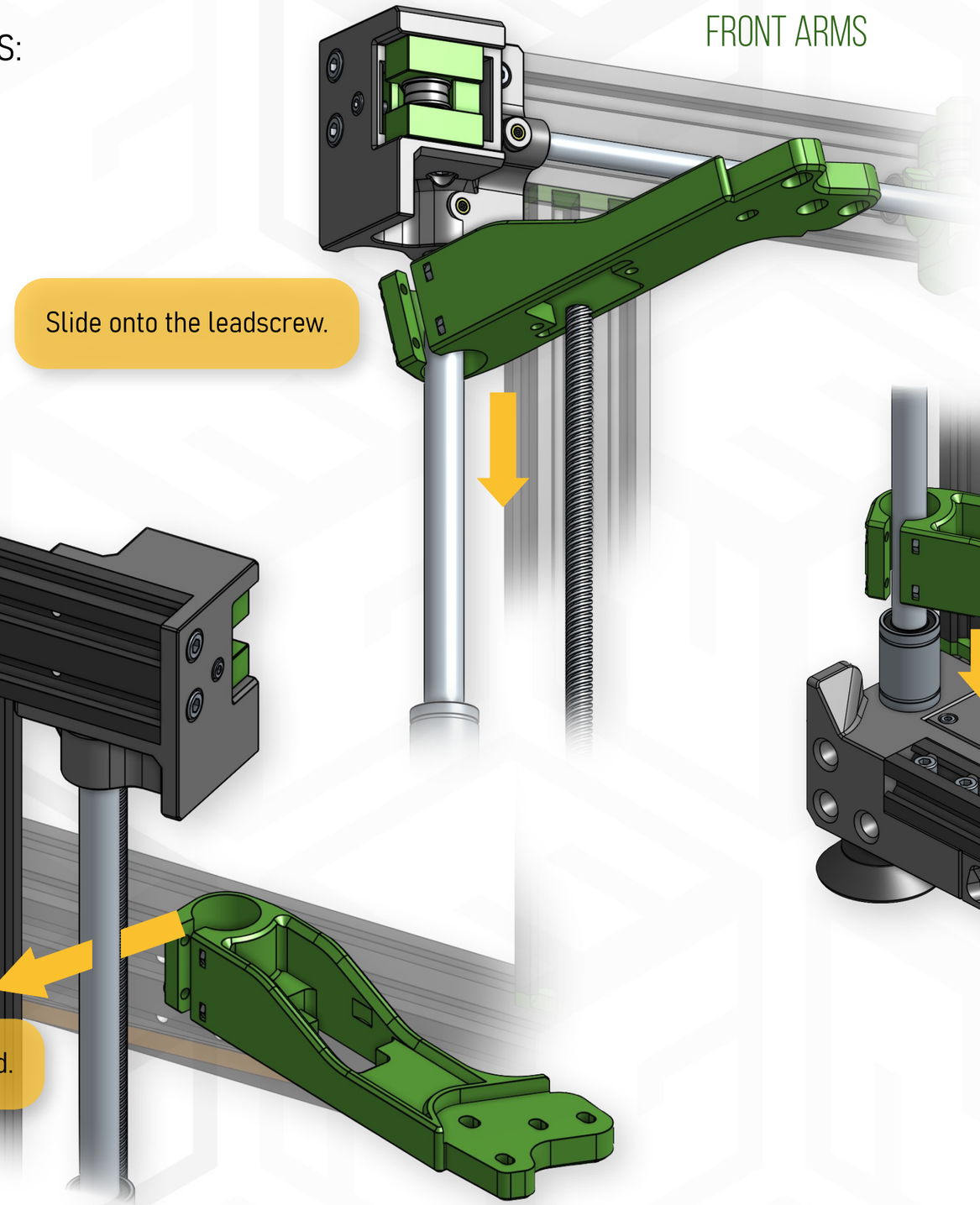
5x M3x20 SHCS

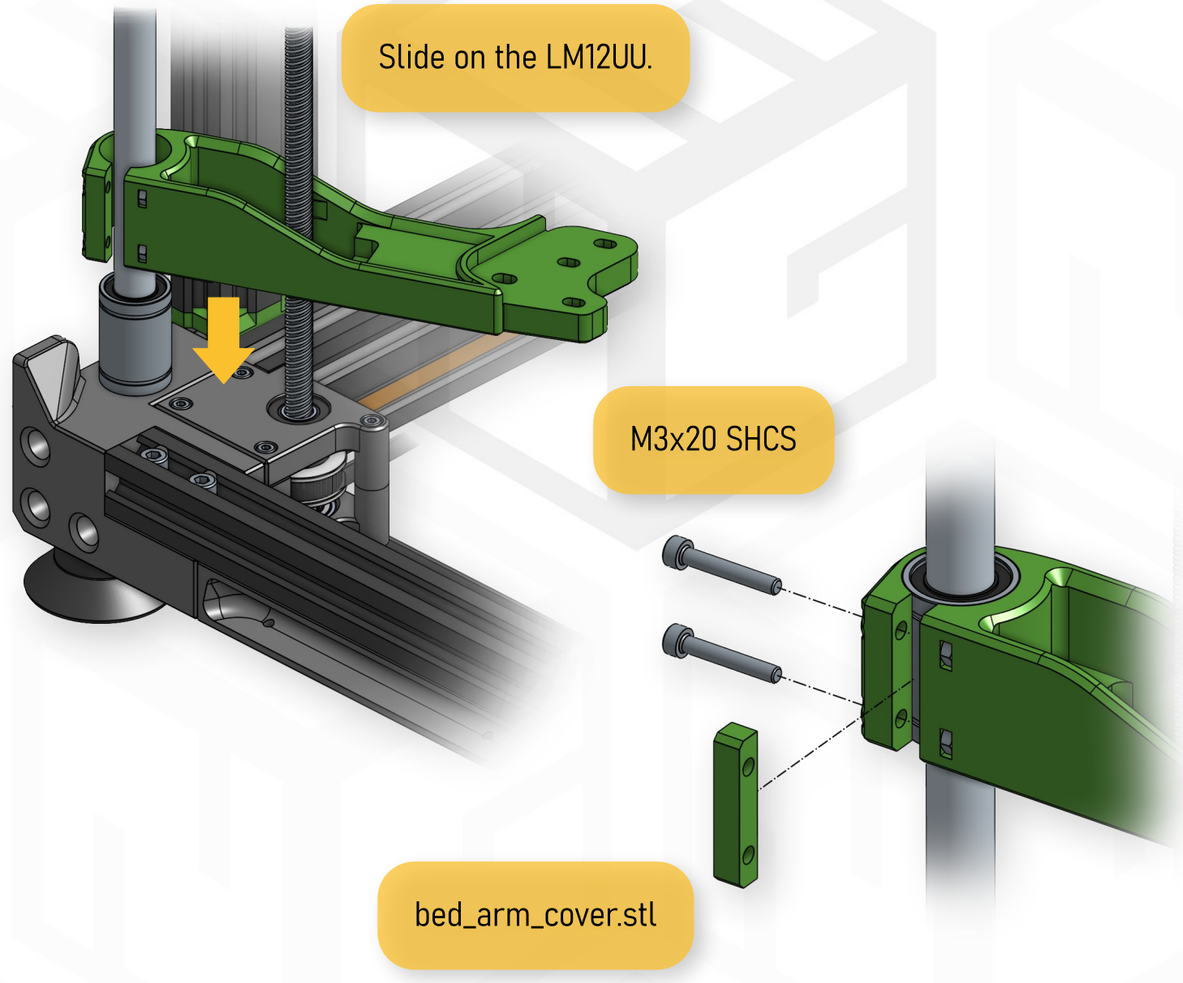
PRINTED PARTS:

2x bed_arm_cover.stl

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

TIP: SNAP IN DESIGN
Left and right arms are designed with a significant gap that allows to snap the part on the linear rod. Don't be afraid of the part breaking.





BED CARRIAGE INSTALL

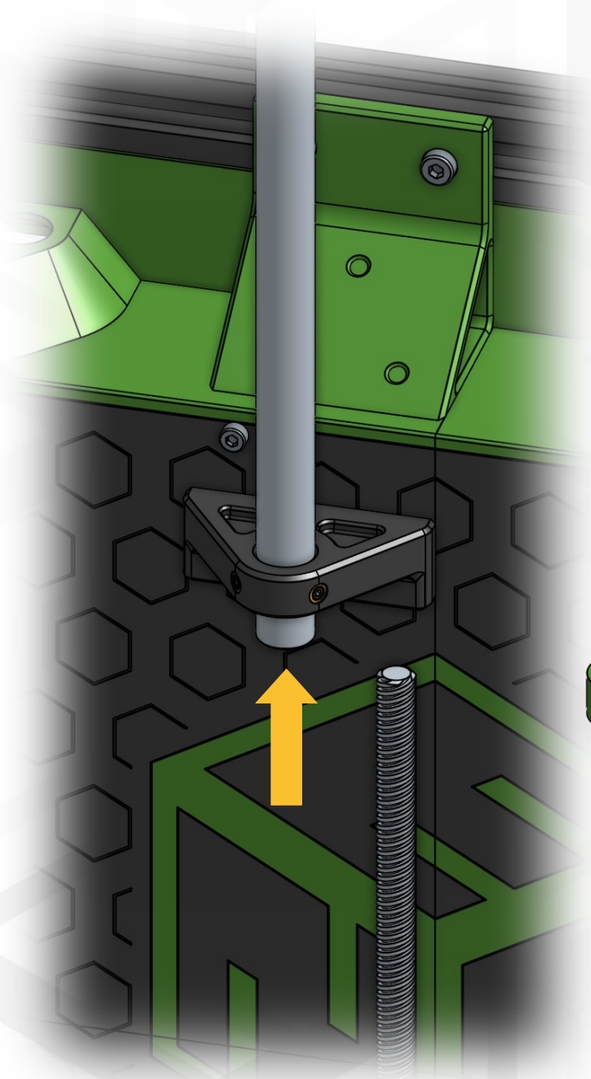
REAR ARM

TOOLS:

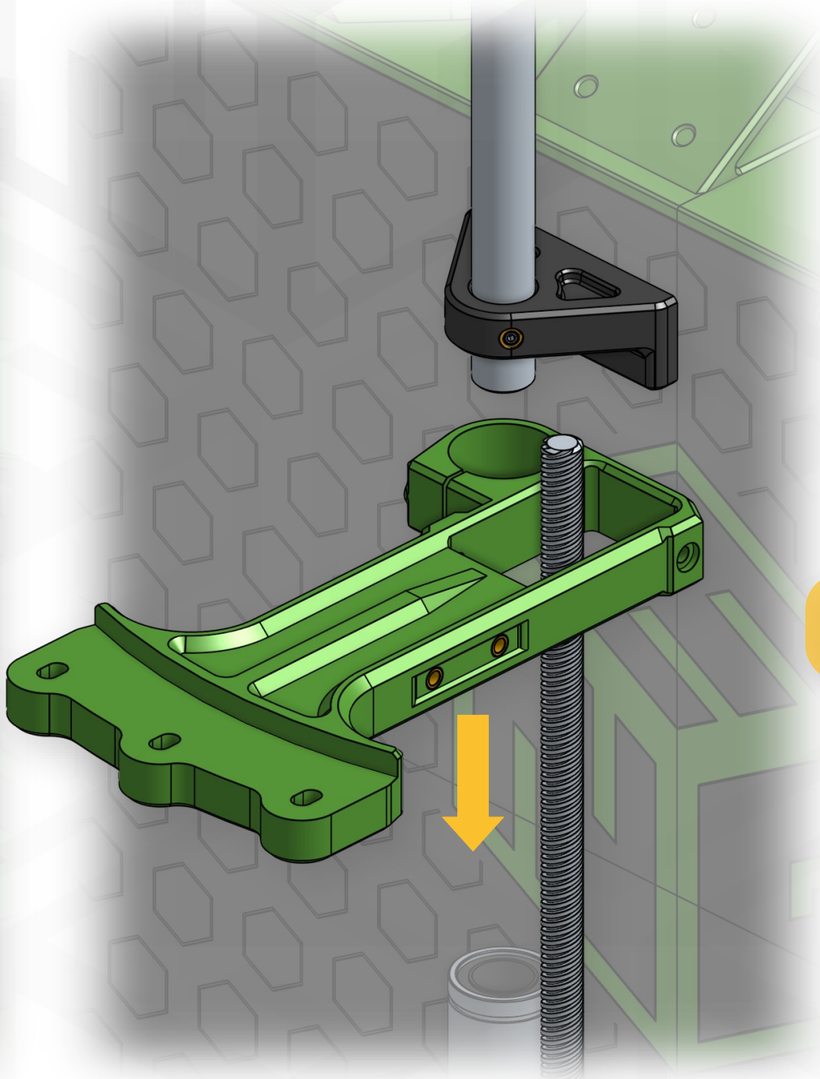
1.5 mm Allen key
2.5 mm Allen key

HARDWARE:

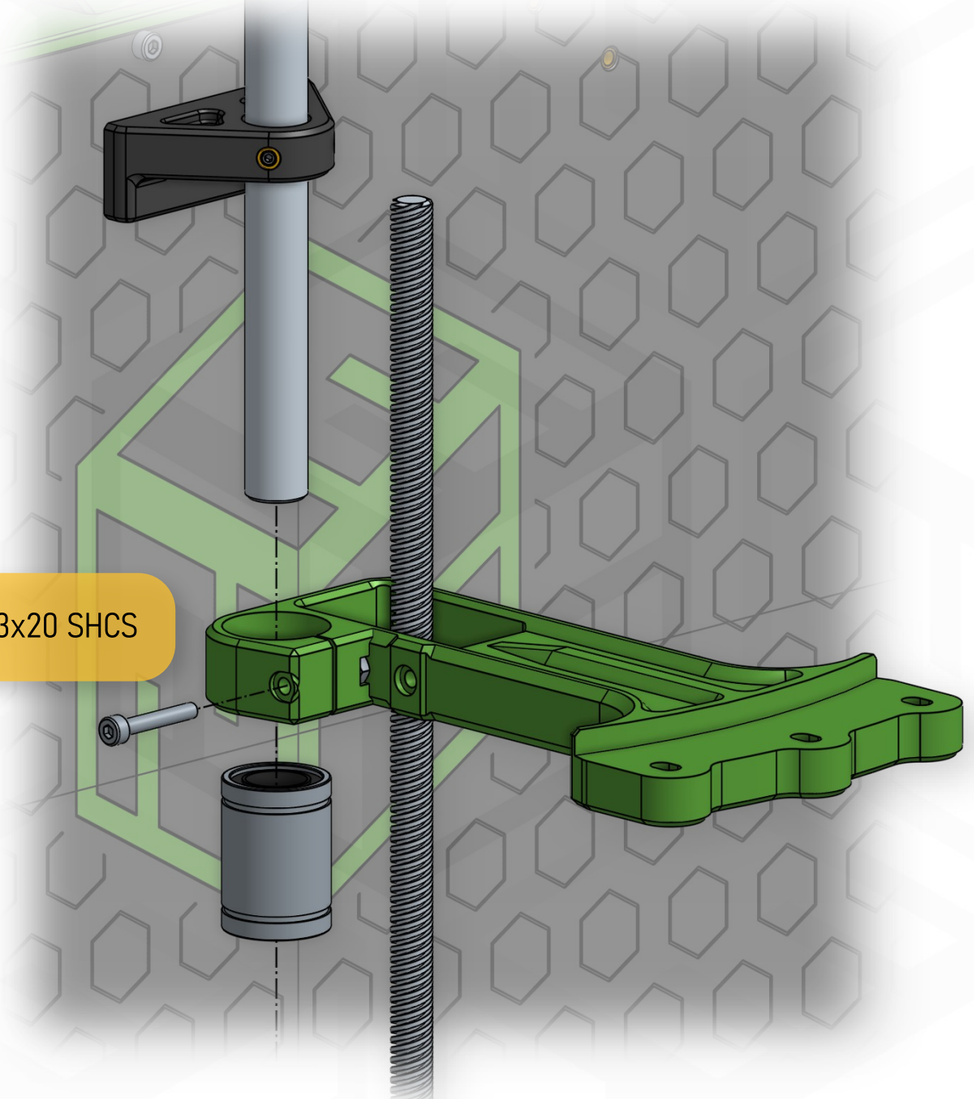
1x M3x20 SHCS



Slide the 12mm rod out partialy.



Slide bed arm onto the leadscrew.



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

BED CARRIAGE INSTALL

REAR ARM

TOOLS:

2.5 mm Allen key

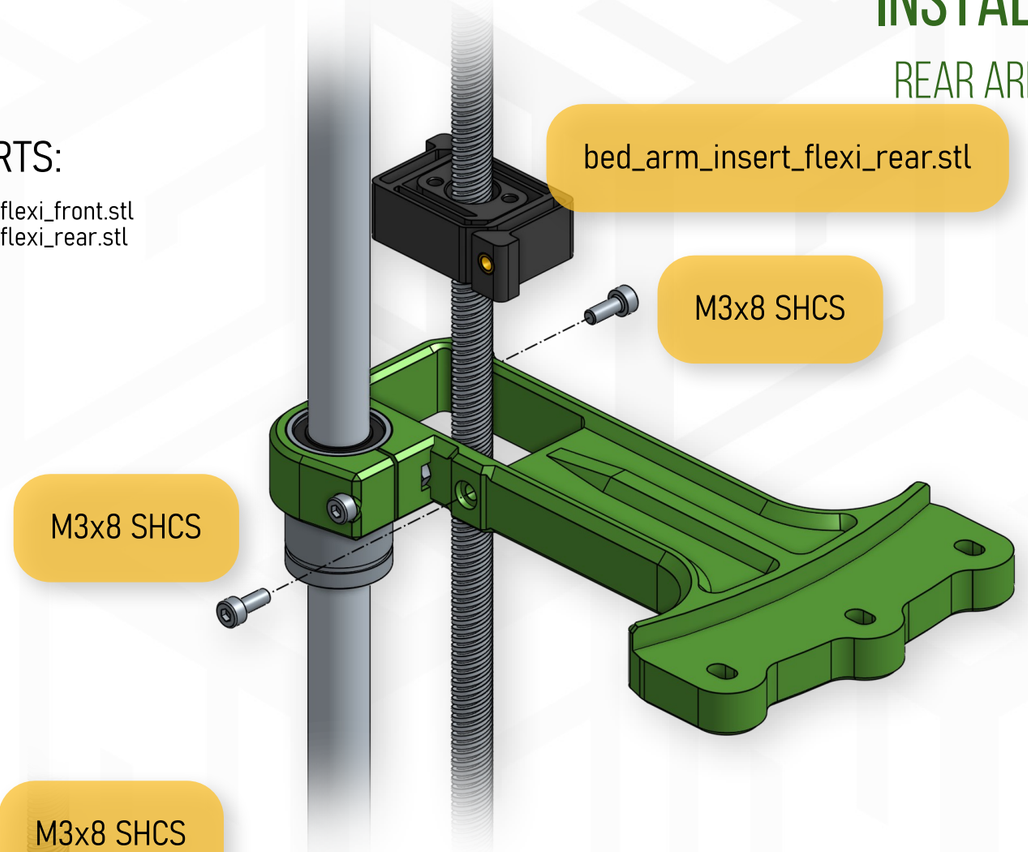
HARDWARE:

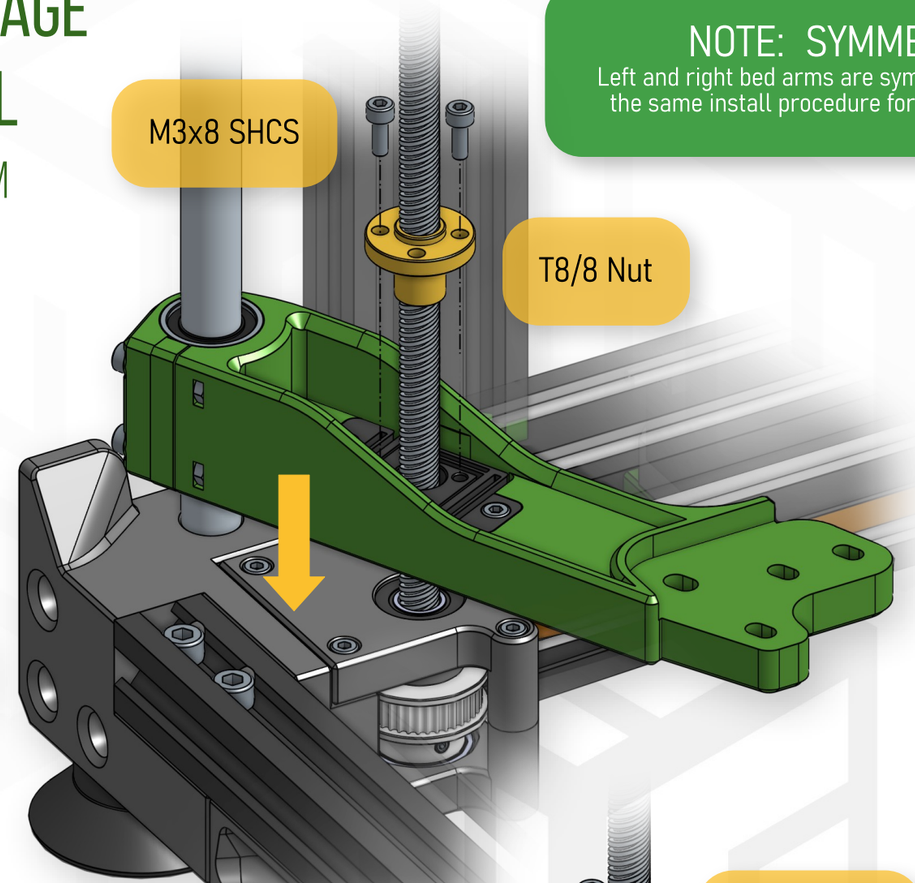
12x M3x8 SHCS

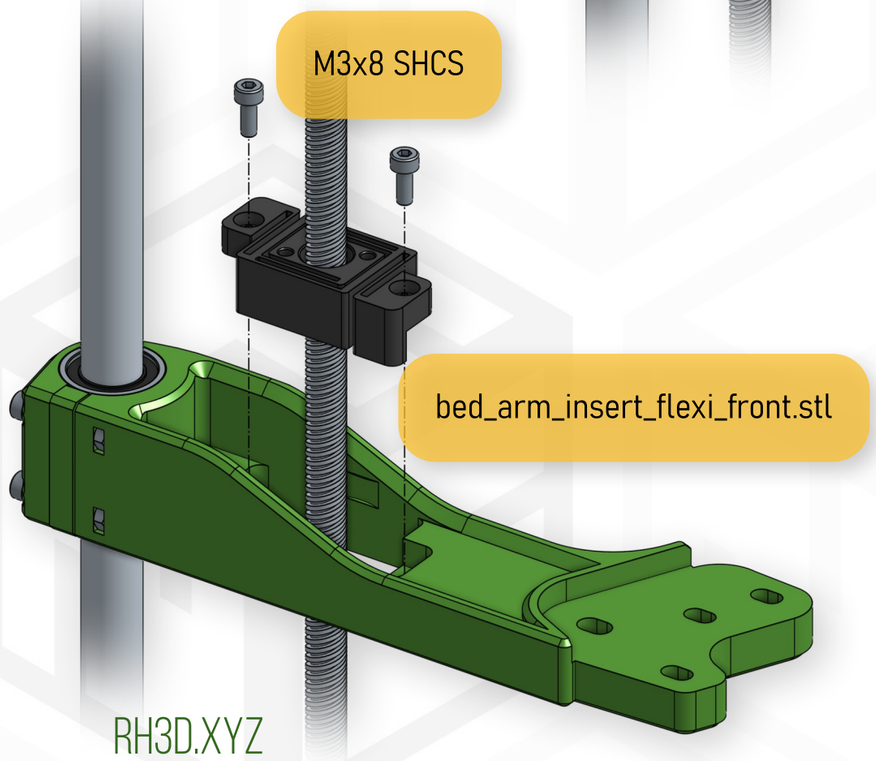
3x T8/8 Nut

PRINTED PARTS:

2x bed_arm_insert_flexi_front.stl
bed_arm_insert_flexi_rear.stl





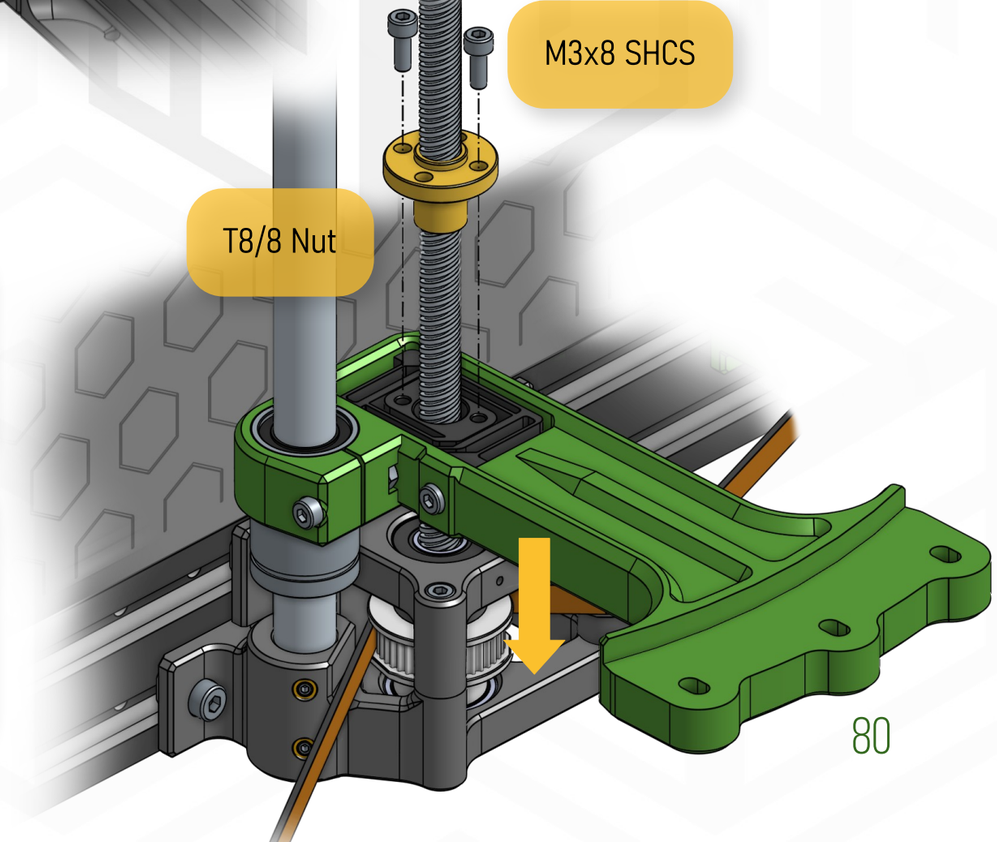


NOTE: SYMMETRY
Left and right bed arms are symmetrical, follow the same install procedure for the other side.

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.

Slightly loosen the Z belt, so you can turn the leadscrews individualy (skip the tooth) and the bed arms will bottom out.



BED CARRIAGE PLATE INSTALL

TOOLS:

3 mm Allen key

HARDWARE:

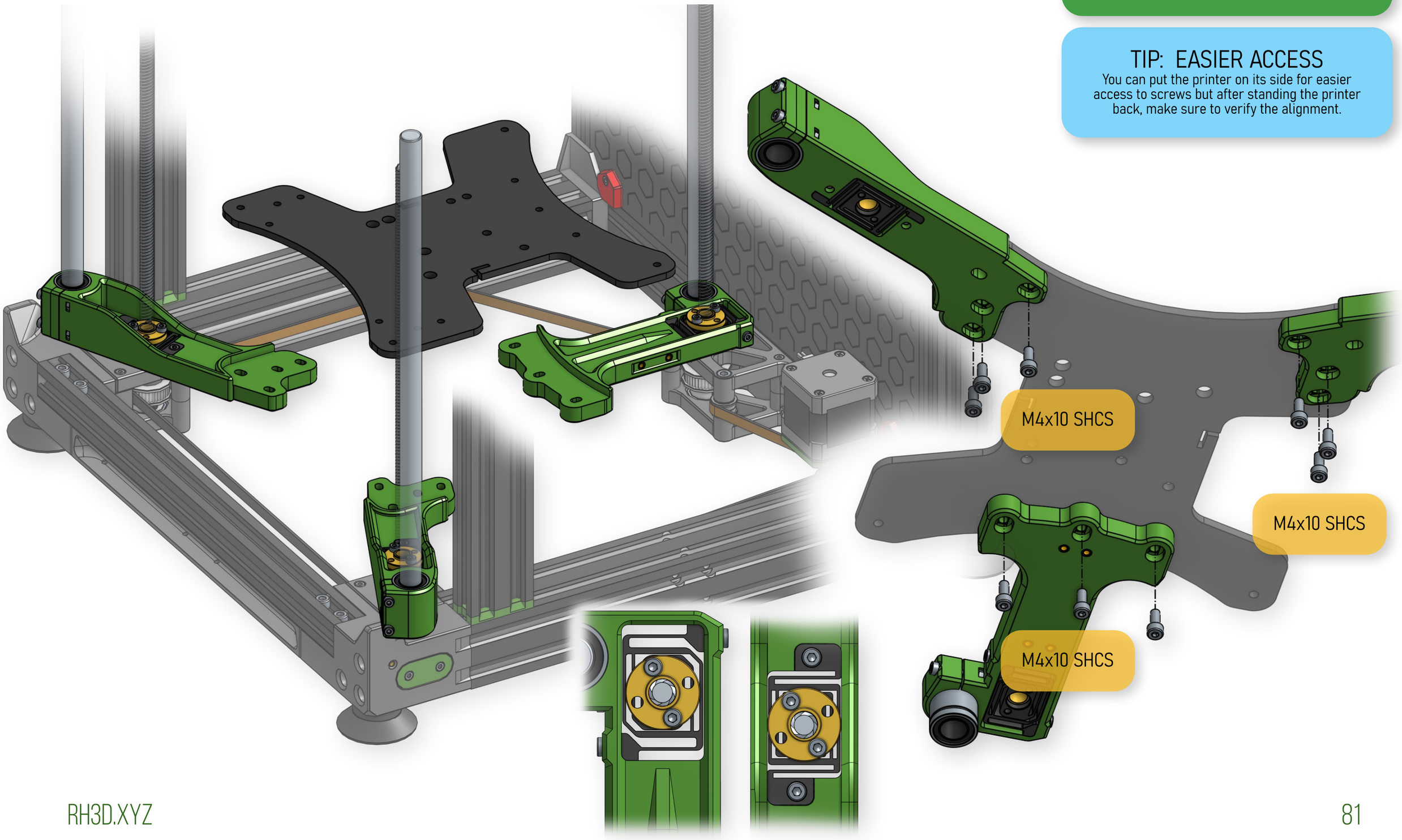
9x M4x10 SHCS

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.



BED CARRIAGE
BED PLATE

TOOLS:

2.5 mm Allen key

HARDWARE:

2x M3x8 SHCS

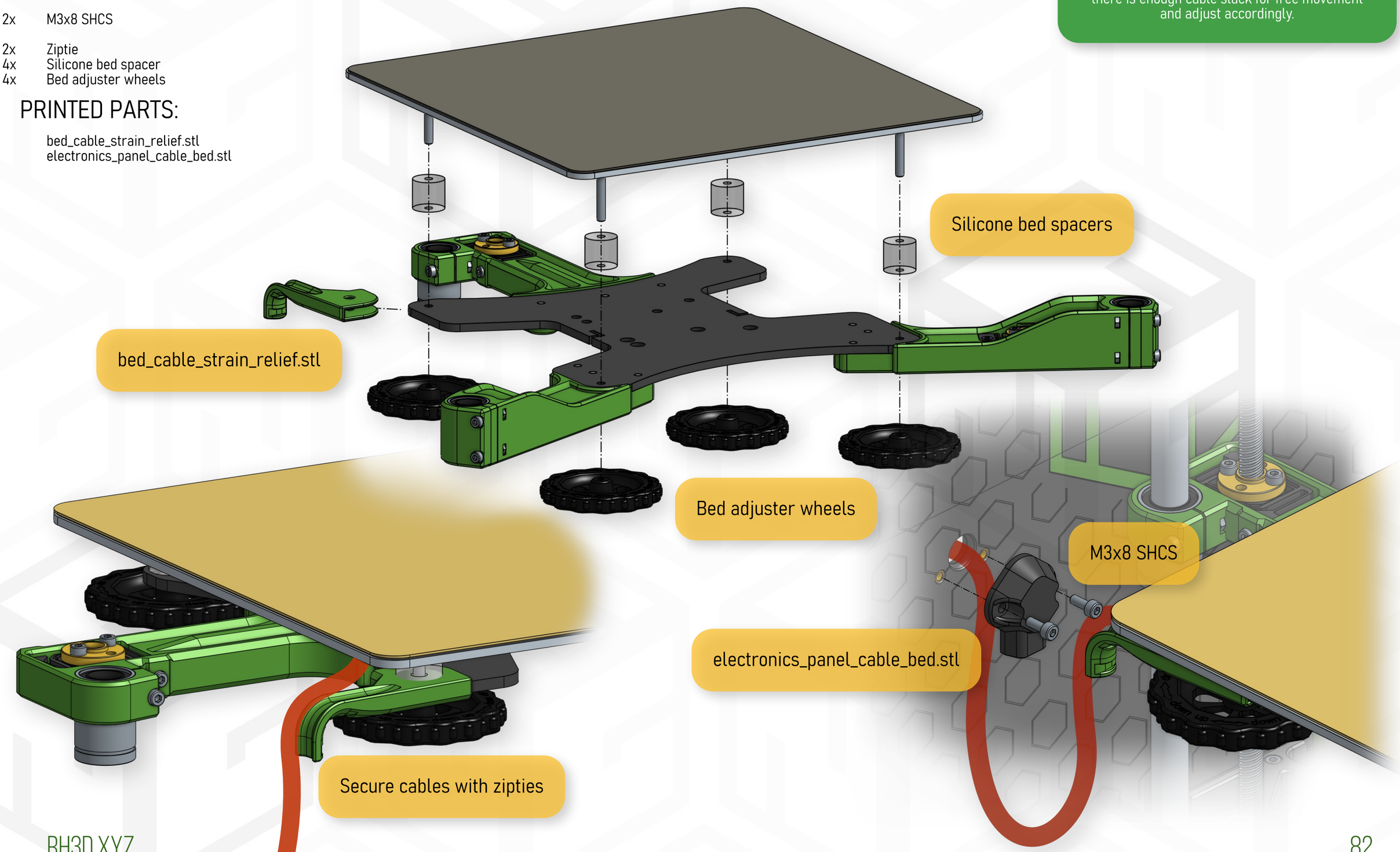
2x Ziptie
4x Silicone bed spacer
4x Bed adjuster wheels

PRINTED PARTS:

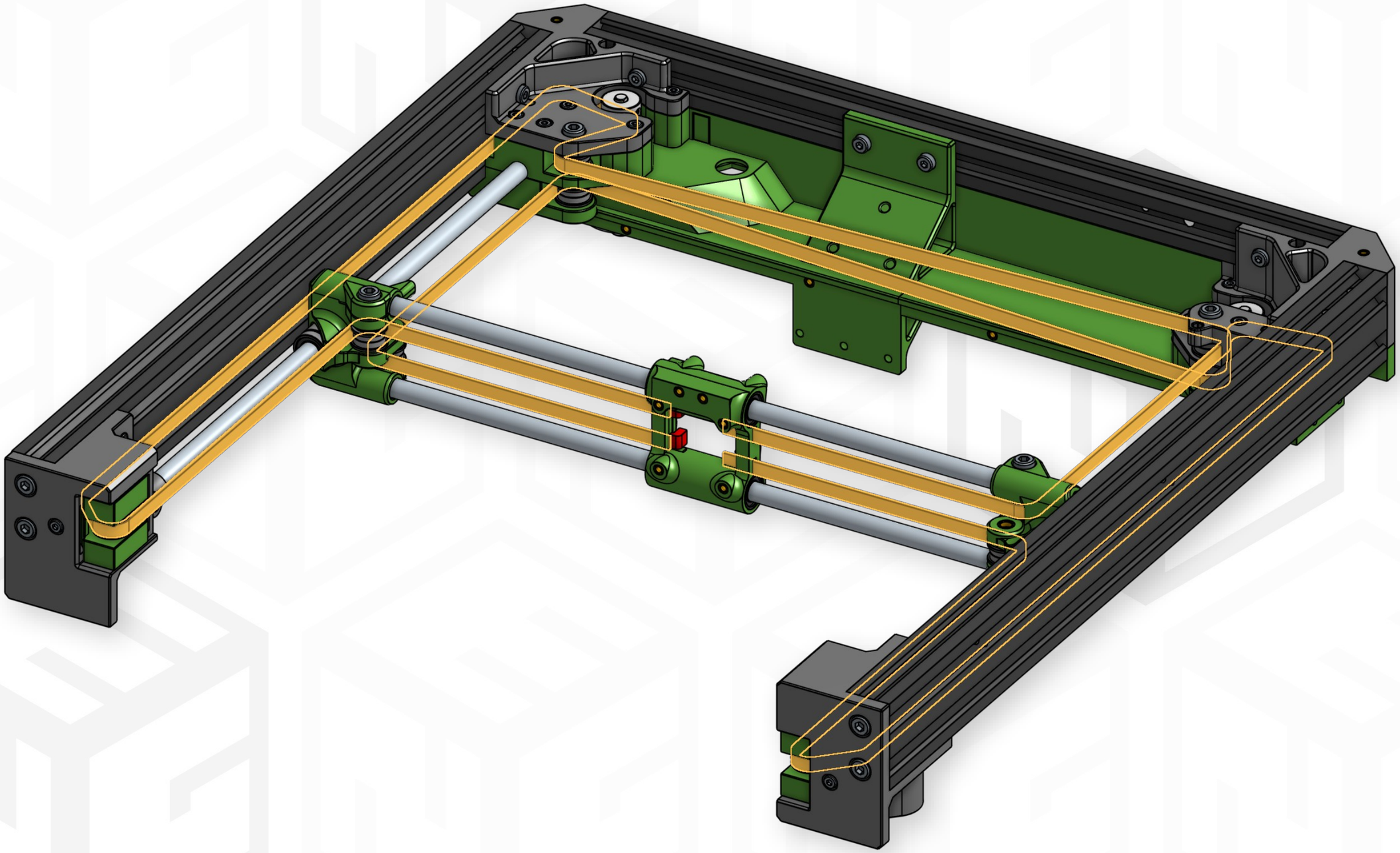
bed_cable_strain_relief.stl
electronics_panel_cable_bed.stl

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:

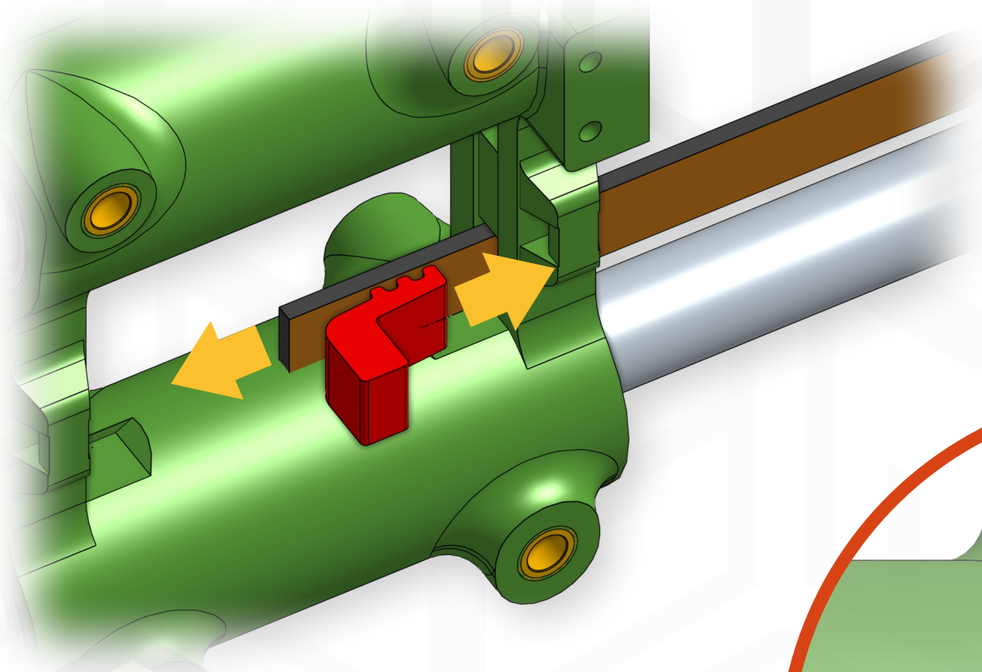
2.5 mm Allen key

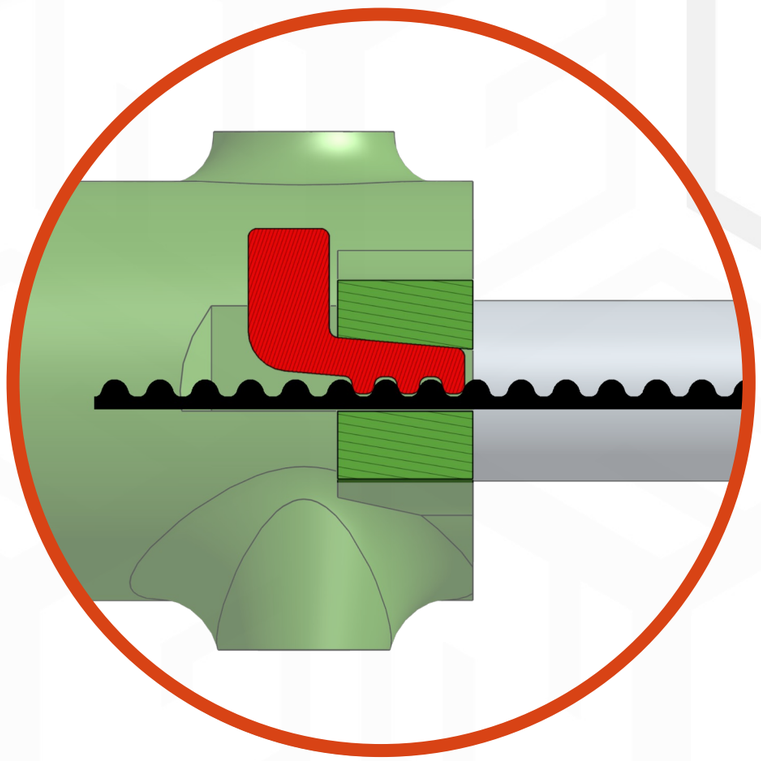
HARDWARE:

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.

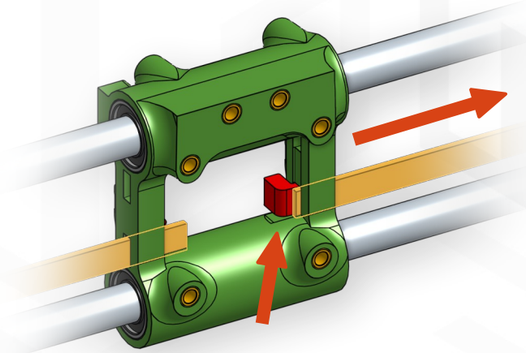
2) The belt end you insert first into the toolhead should be in just the minimal amount so when you route the belt and insert the other end, you will have more to grab onto.

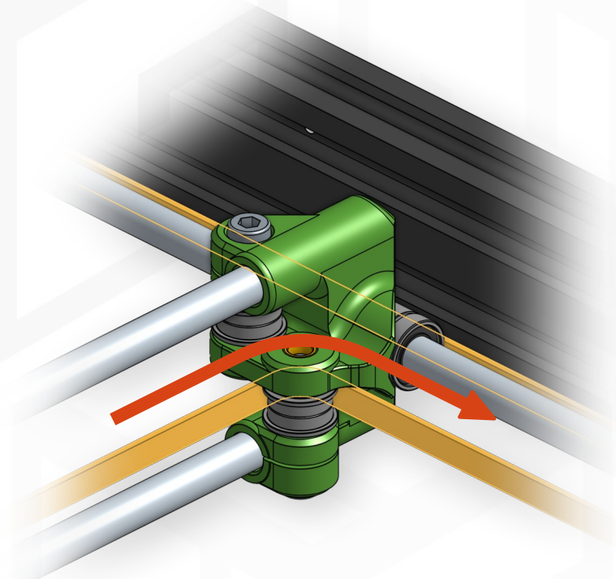
3) The easiest way to secure the belt into the toolhead is to pull the belt end from one side (front) and install the belt lock from the other side (rear).

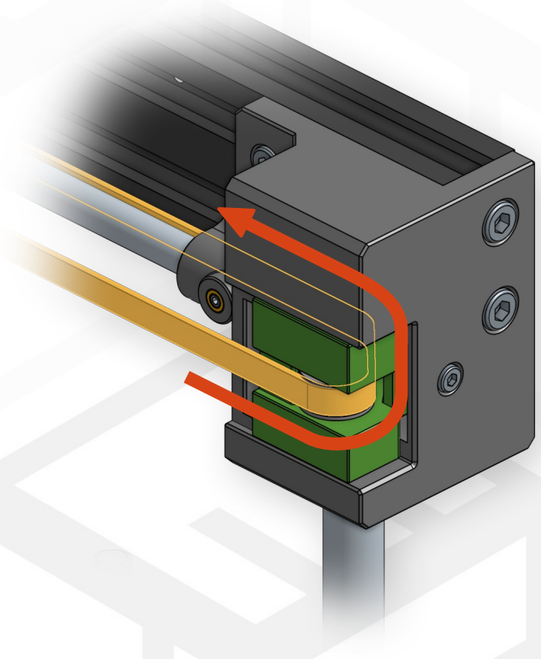
TIP: BELT PATH

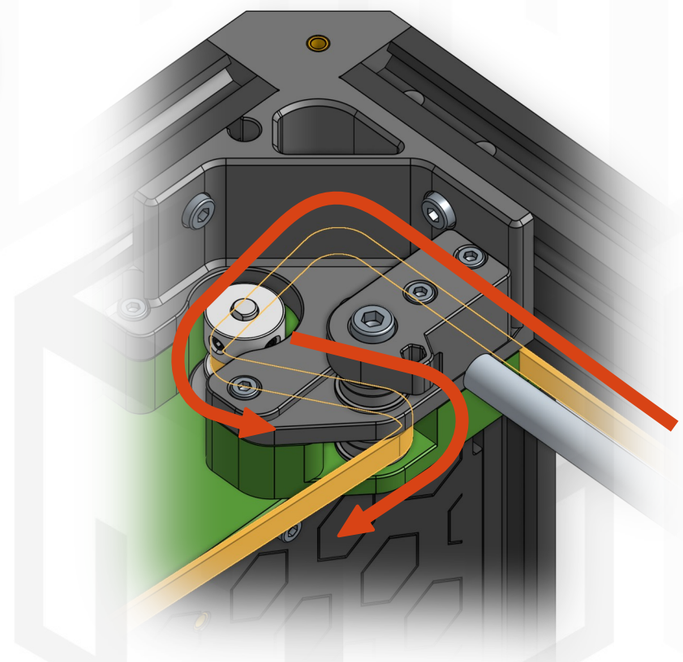
The belt path is well defined by the parts shape to allow for easy install in places, where you can't see. The belt should be easily guided when just pushed in.
If the belt gets stuck, it might be going onto the F695 flange so try going in and out few times until it sits properly.

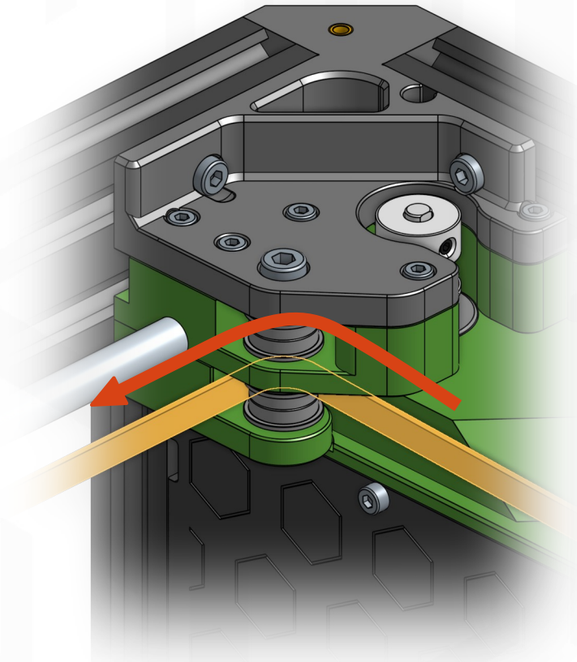
AB BELTS
A BELT (RIGHT)

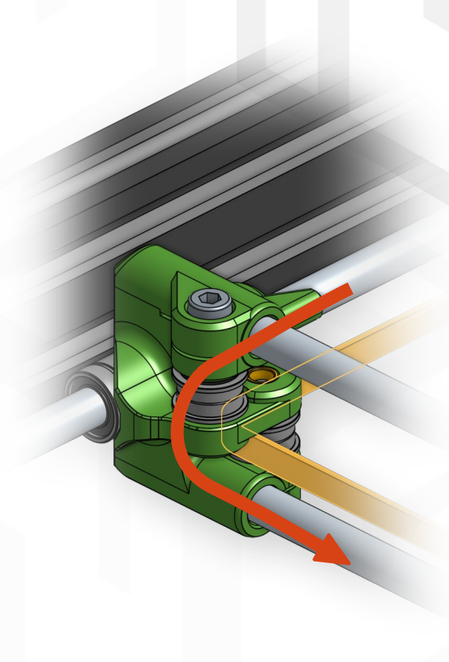


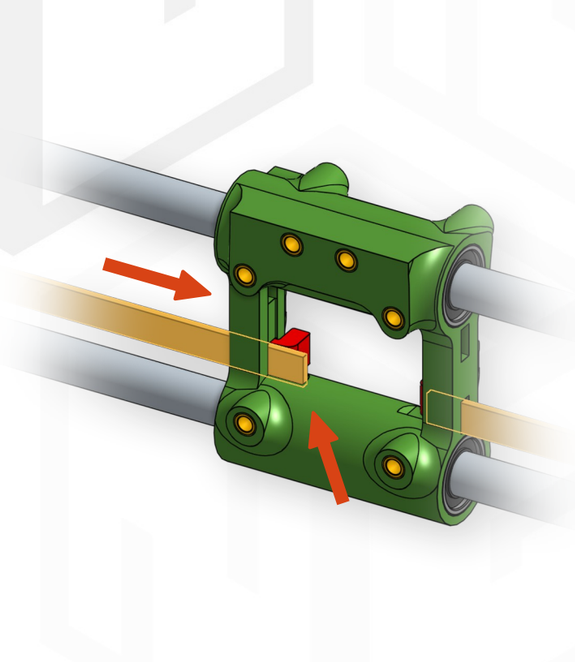




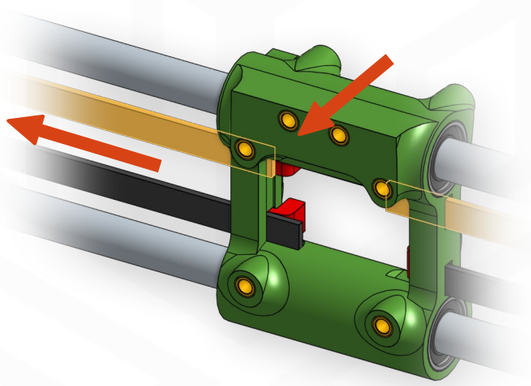


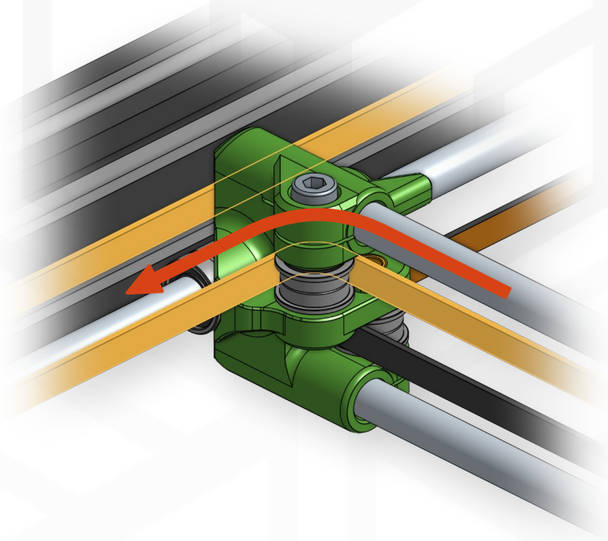


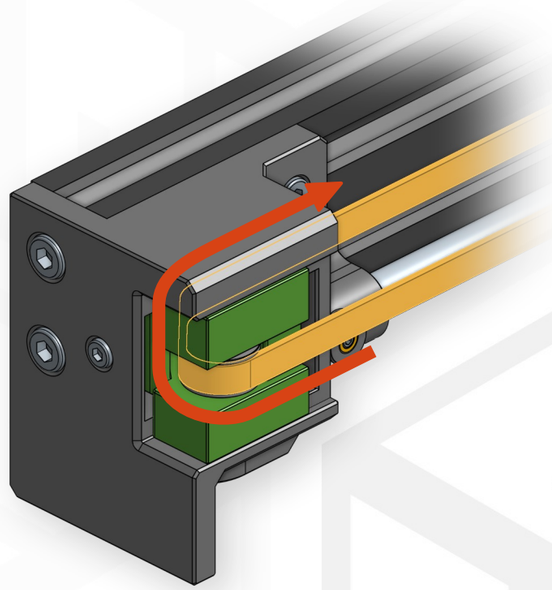




AB BELTS
B BELT (LEFT)







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

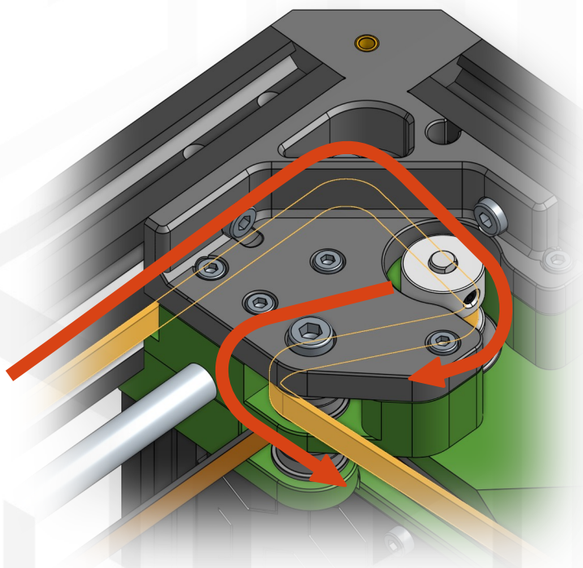
After installing belts, tighten them equally and test the motion, it should make no rubbing noises and should be smooth along the entire path.

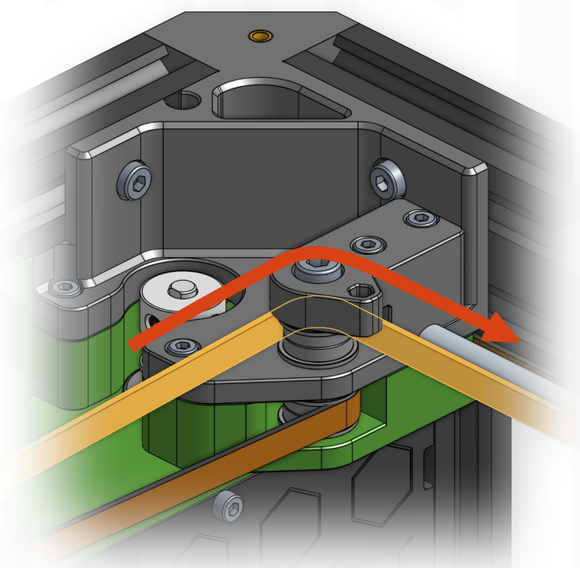
Both X and Y motion are engaging both stepper motors, so it is normal when the toolhead doesn't want to move only along X or Y axis.

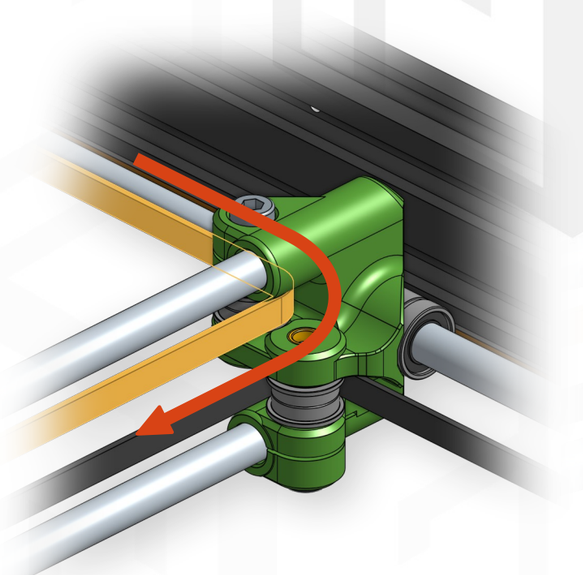
WARNING: BELT TENSION

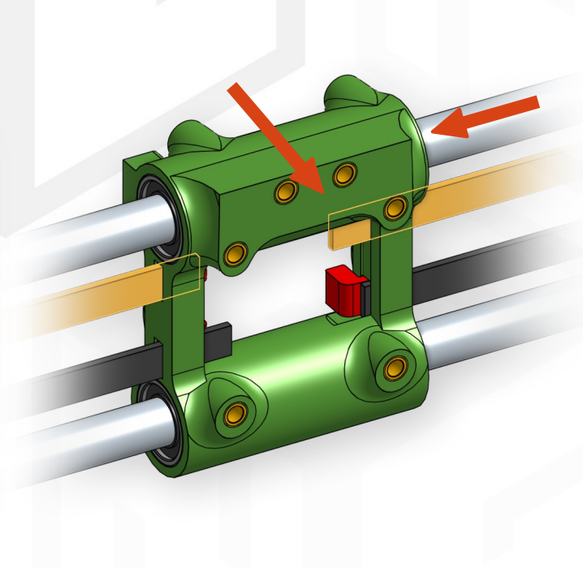
For proper tension, pluck the rear part of the belt and measure the frequency.
It should be 56 Hz.

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)

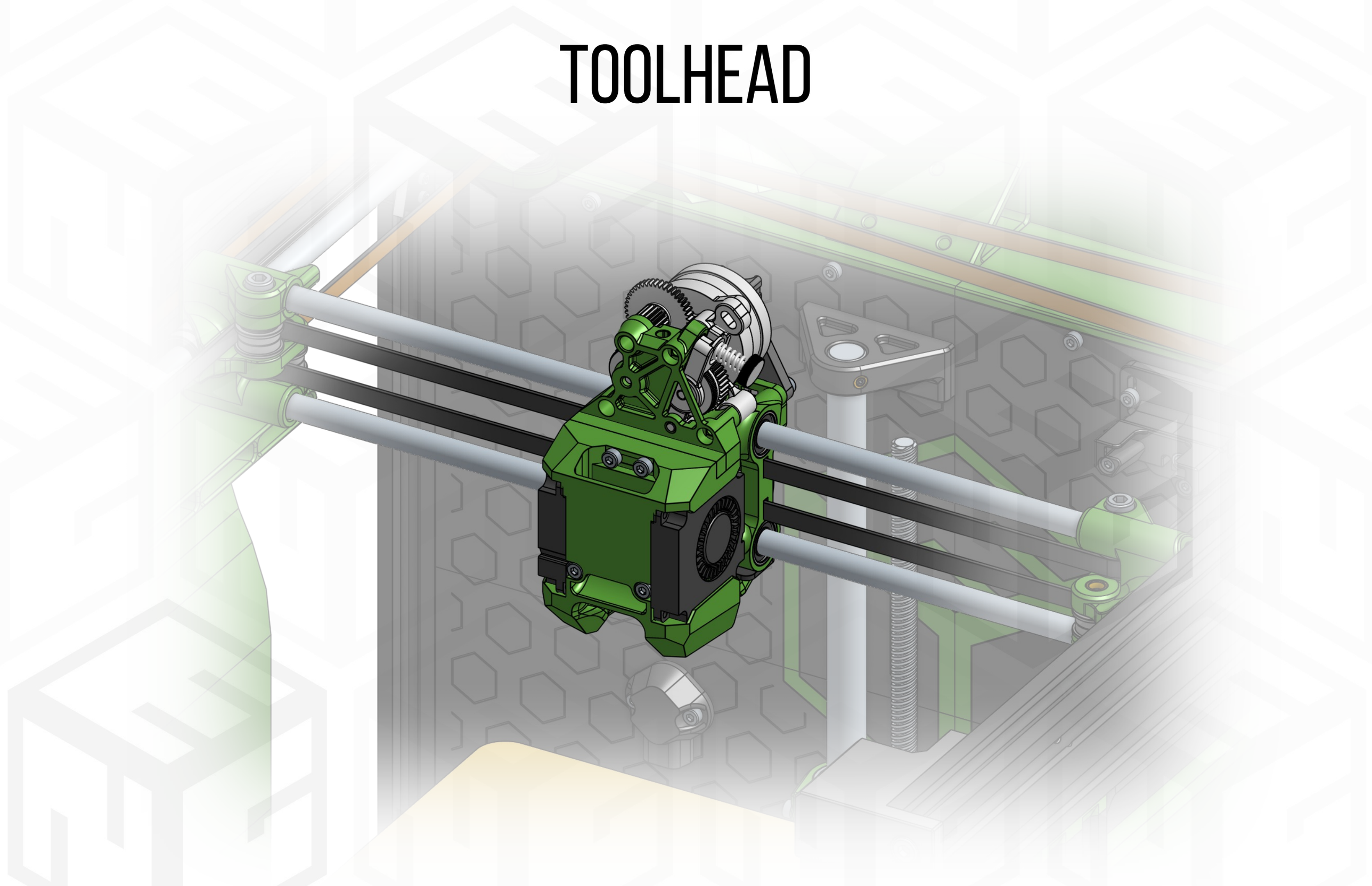








TOOLHEAD

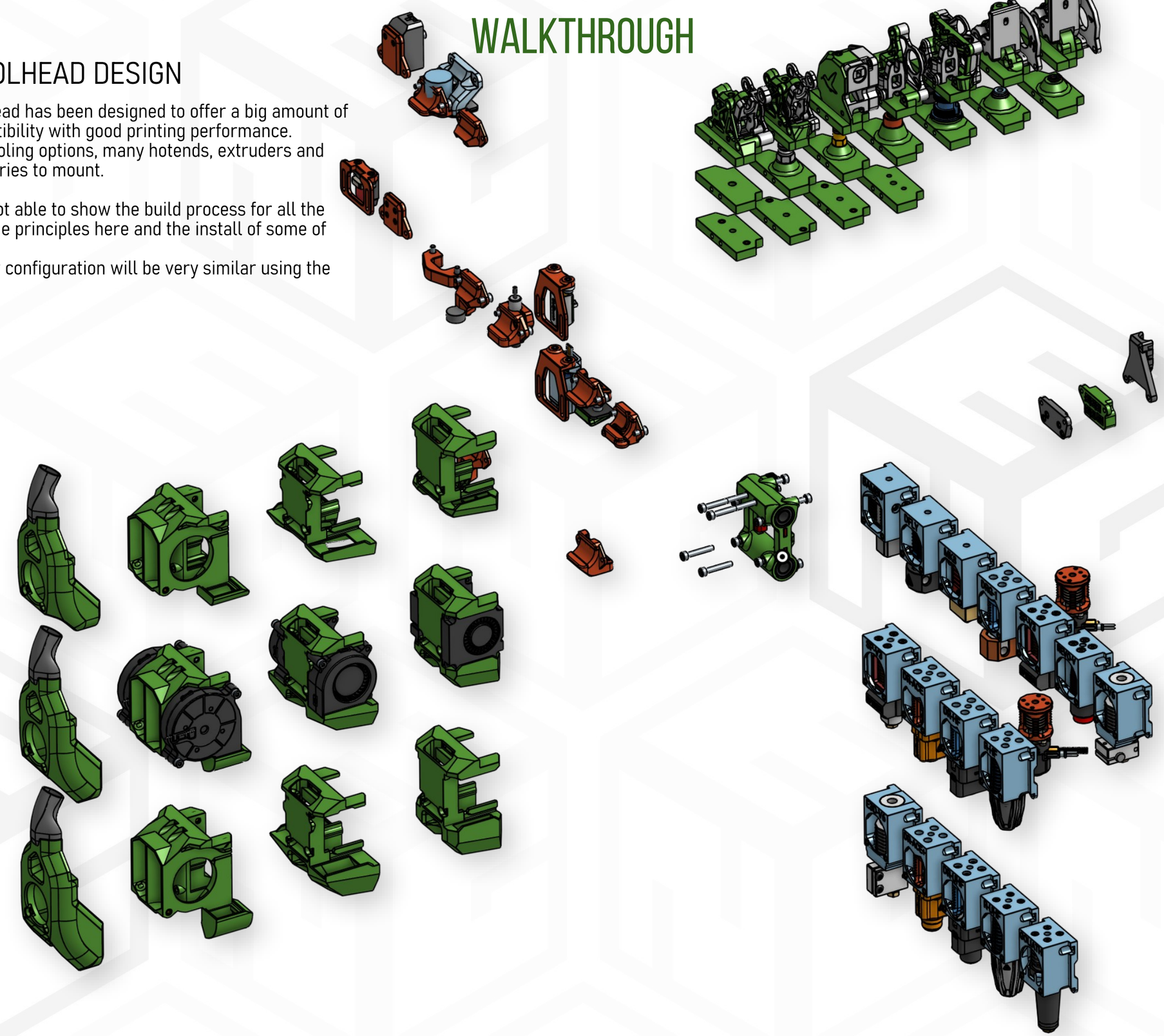


TOOLHEAD WALKTHROUGH

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

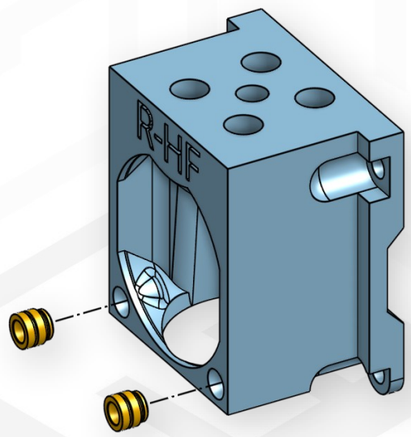
4x M2.5x8 SHCS (or other based on your hotend mounting)

1x ZipTie

PRINTED PARTS:

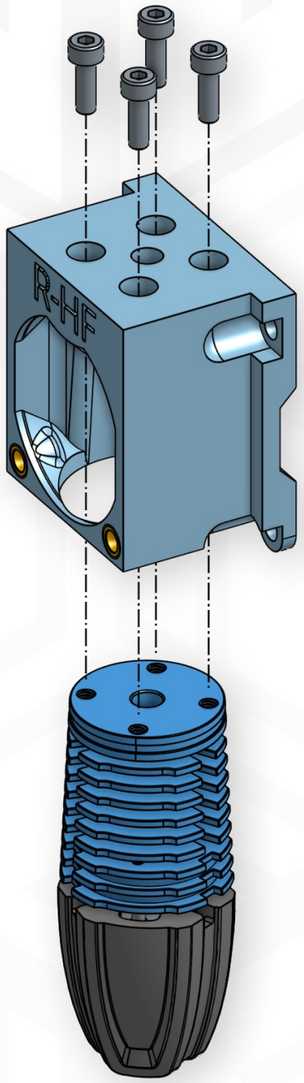
toolhead_hotend_XXXXX.stl

toolhead_hotend_XXXXX.stl

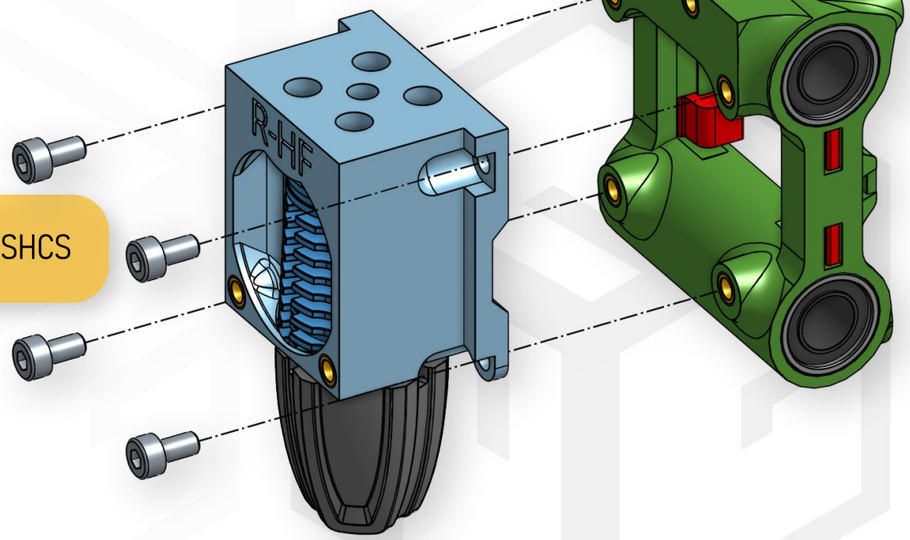


M3 Heat Set Inserts

M2.5 x 8 SHCS



M3x6 SHCS

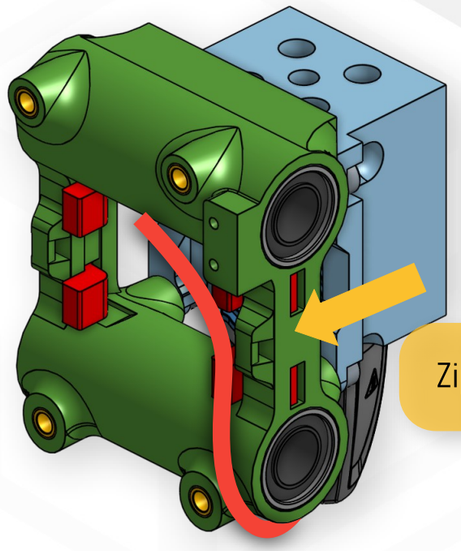


HOTEND VARIANTS

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

WARNING: REMOVE SUPPORT

If present, break off the built-in supports marked with ✕.



Zip tie

TIP: HOTEND WIRES

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

TOOLHEAD FANDUCT

4010 COOLING

TOOLS:

2.5 mm Allen key

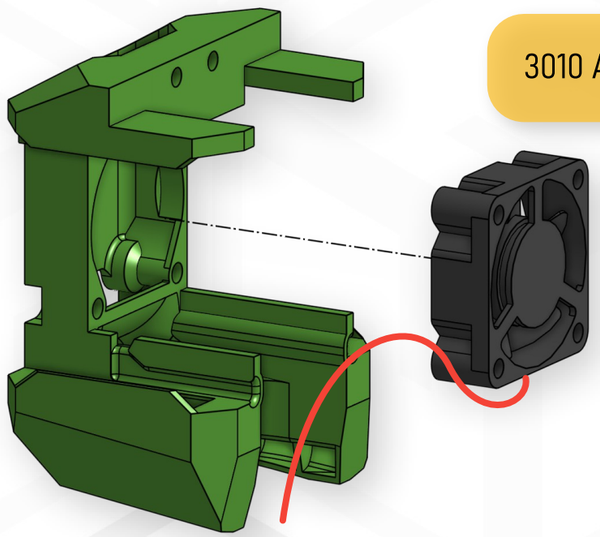
HARDWARE:

2x M3x20 SHCS

2x 3010 axial fan
4010 radial fan

PRINTED PARTS:

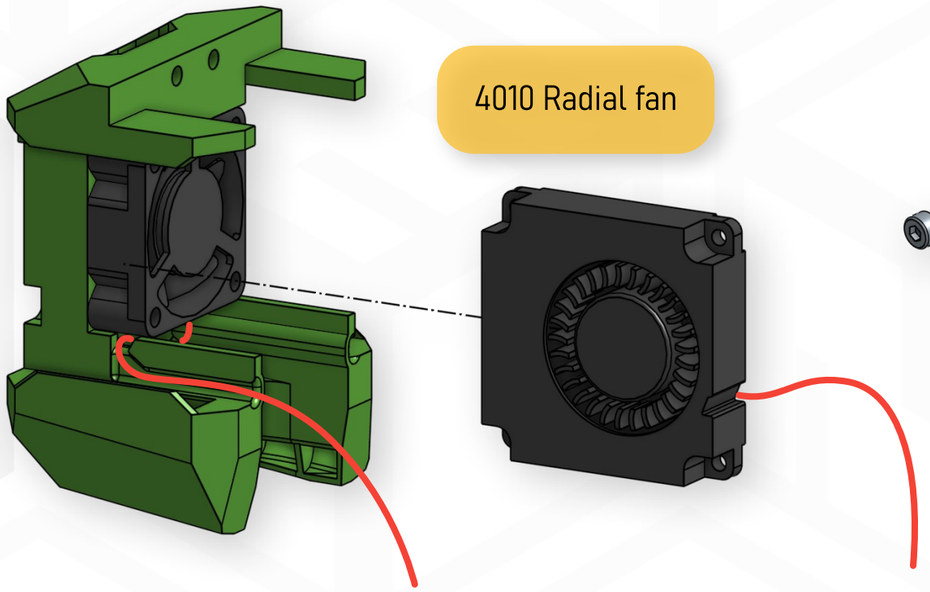
toolhead_fanduct_4010_X.stl



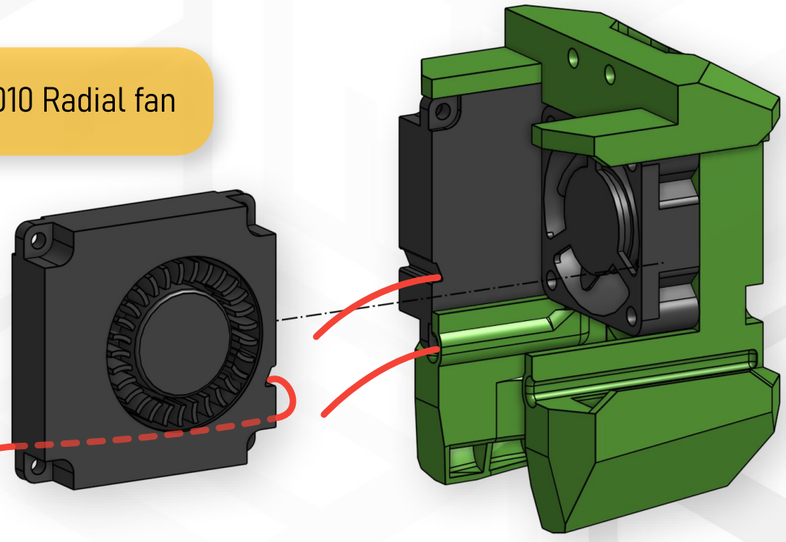
toolhead_fanduct_4010_X.stl

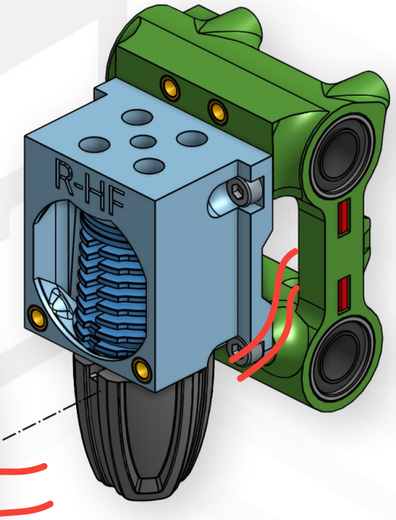
3010 Axial fan

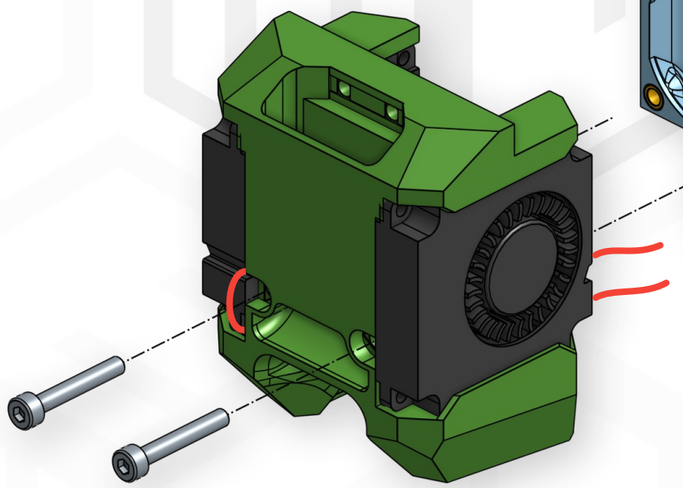
4010 Radial fan



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.

TOOLHEAD FANDUCT

4020 COOLING

TOOLS:

Heat set insert press
2.5 mm Allen key

HARDWARE:

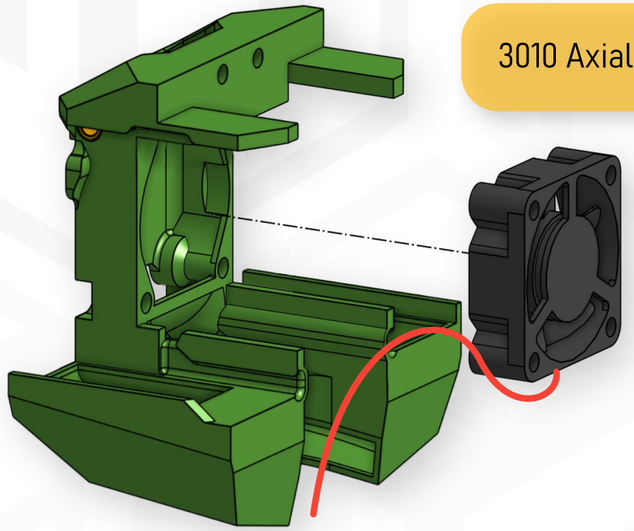
2x M3 Heat set insert

2x M3x16 SHCS
2x M3x20 SHCS

3010 axial fan
2x 4020 radial fan

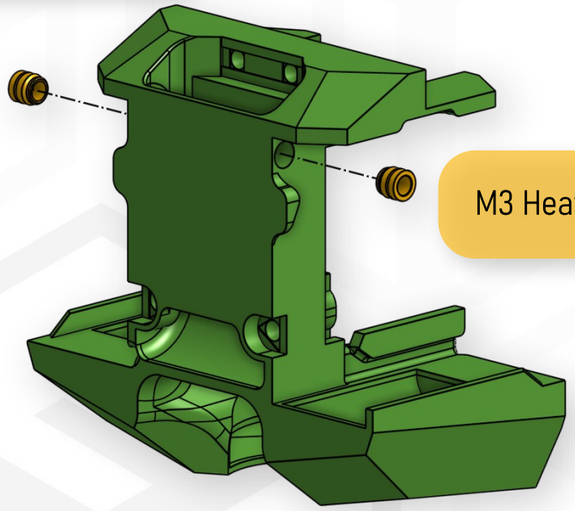
PRINTED PARTS:

toolhead_fanduct_4010_X.stl



3010 Axial fan

M3 Heat Set Insert

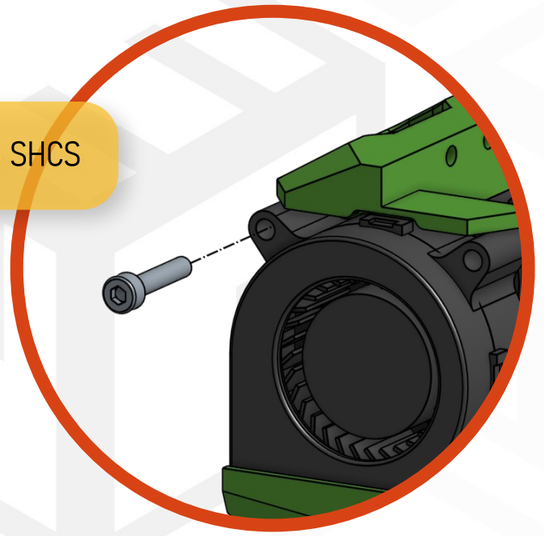


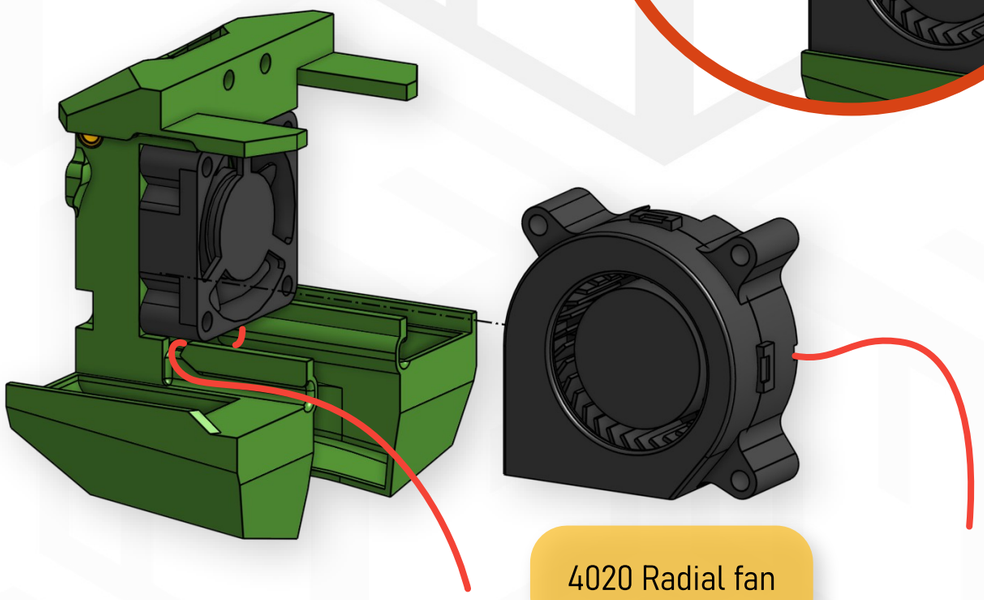
toolhead_fanduct_4020_X.stl

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.

M3x16 SHCS



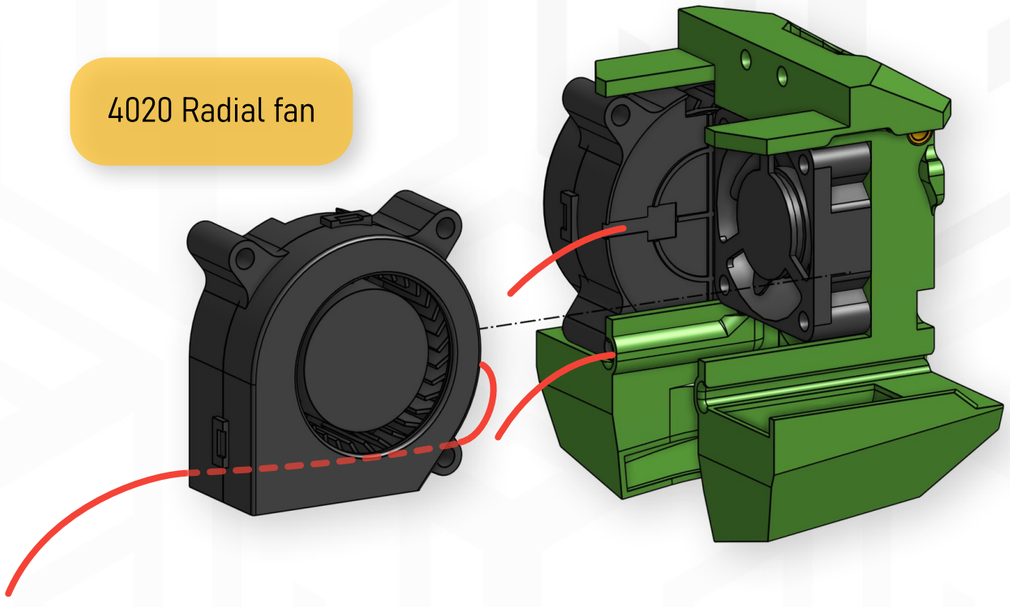


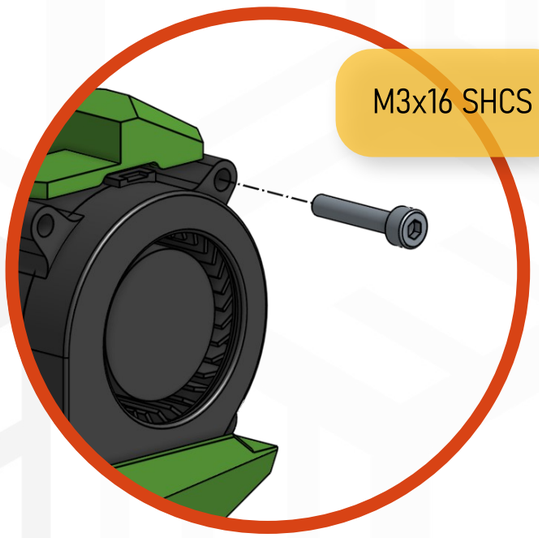
4020 Radial fan

TOOLHEAD FANDUCT

4020 COOLING

4020 Radial fan



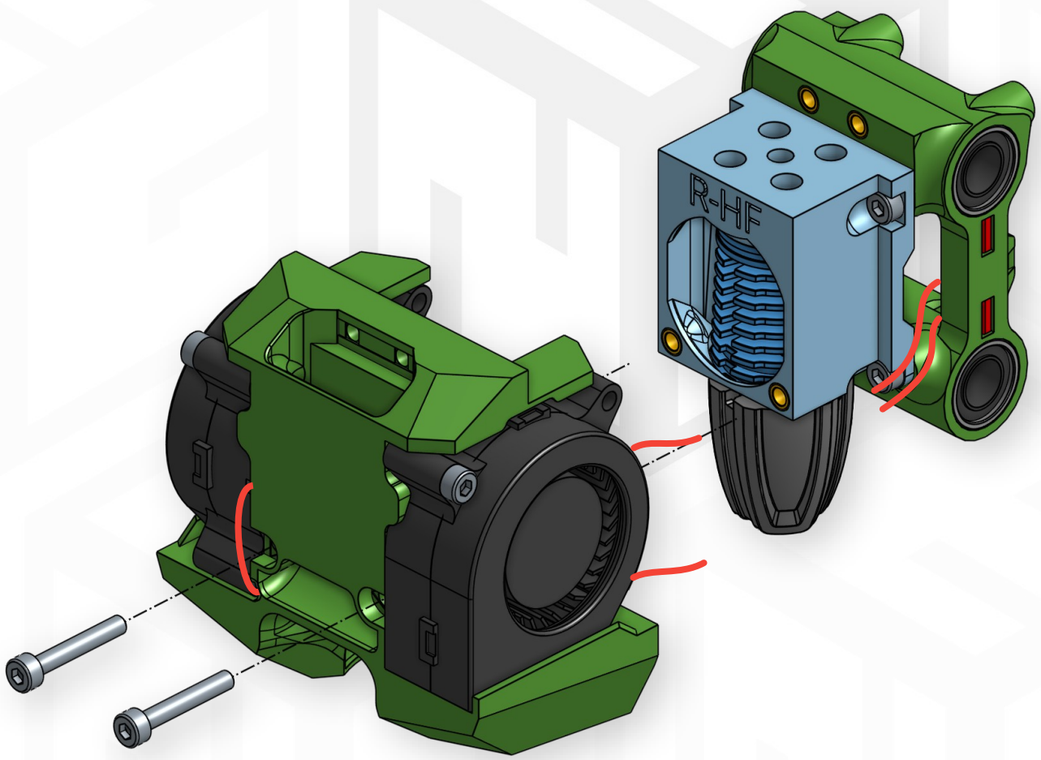


TIP: HOTEND WIRING

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.



TOOLHEAD FANDUCT

5015 COOLING

TOOLS:

Heat set insert press
2.5 mm Allen key

HARDWARE:

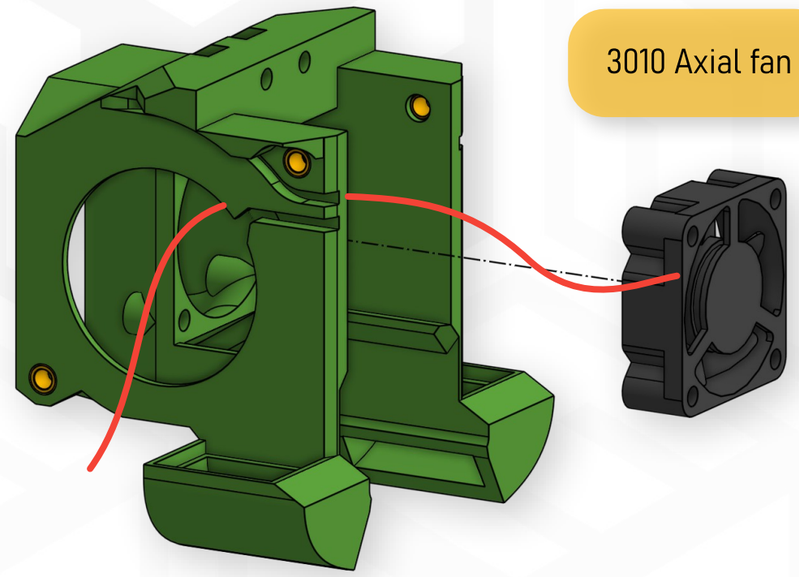
4x M3 Heat set insert

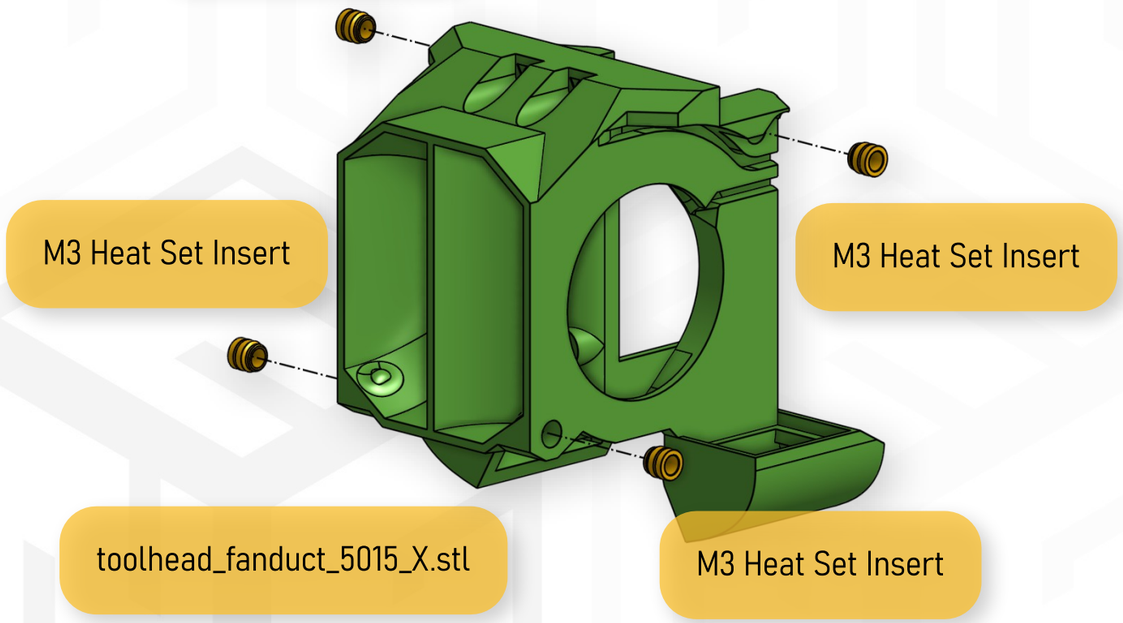
6x M3x20 SHCS

2x 3010 axial fan
5015 radial fan

PRINTED PARTS:

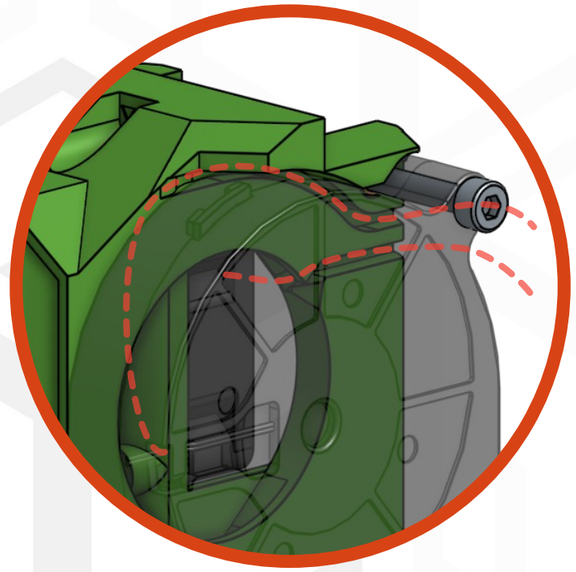
toolhead_fanduct_5015_X.stl

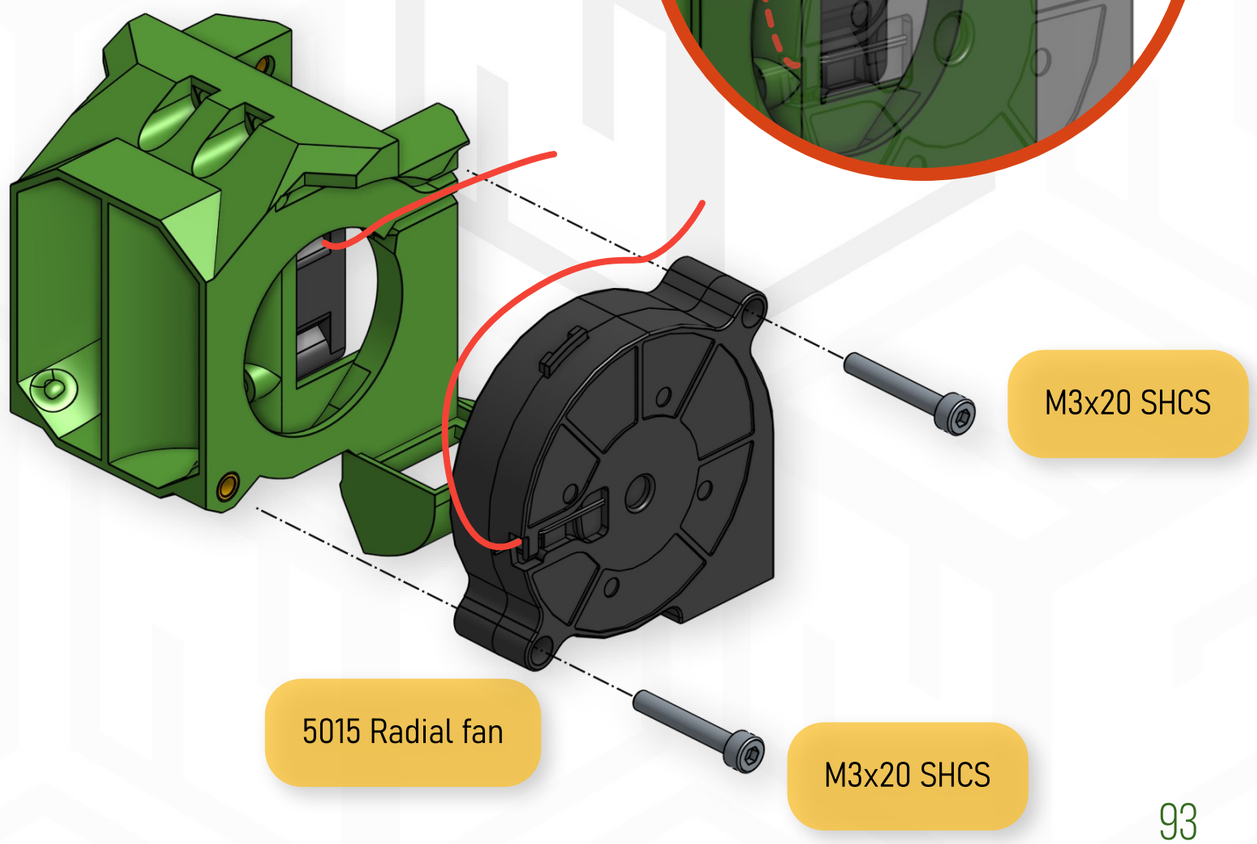




TIP: FAN WIRING
Follow the wiring scheme for each fan and run the wires through the designated channel. Then guide the wires between the hotend mount and the toolhead carriage.

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





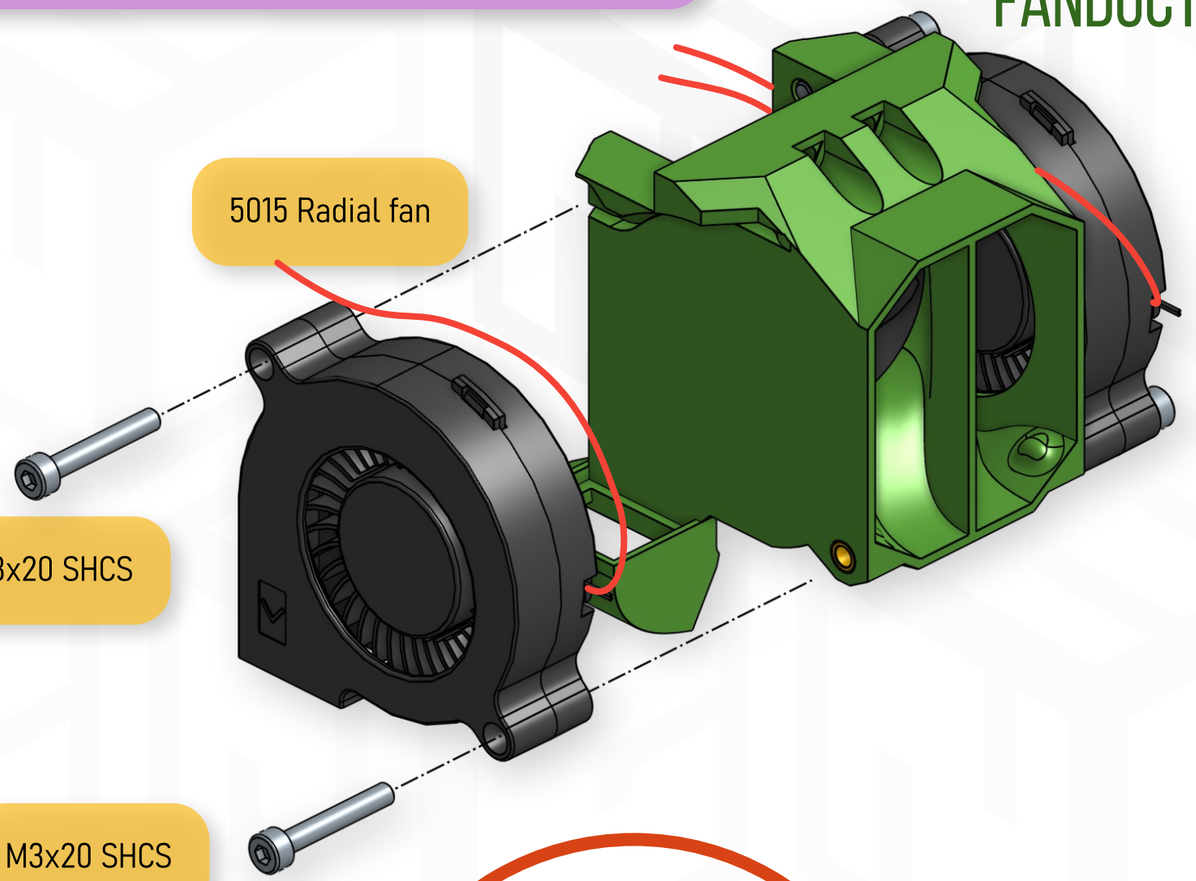
TOOLHEAD FANDUCT

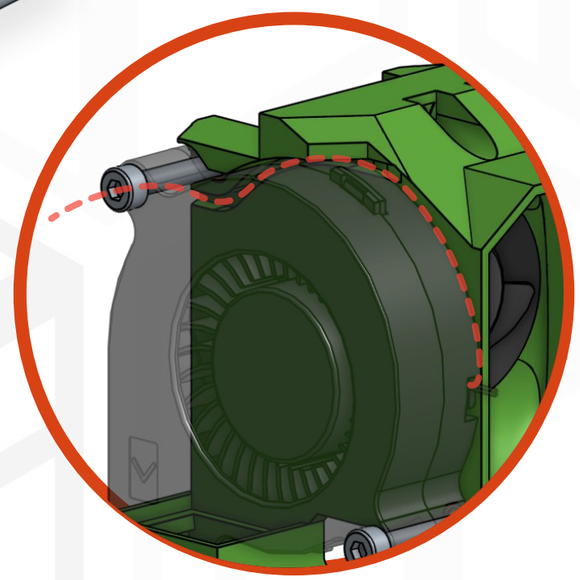
5015 COOLING

5015 Radial fan

M3x20 SHCS

M3x20 SHCS



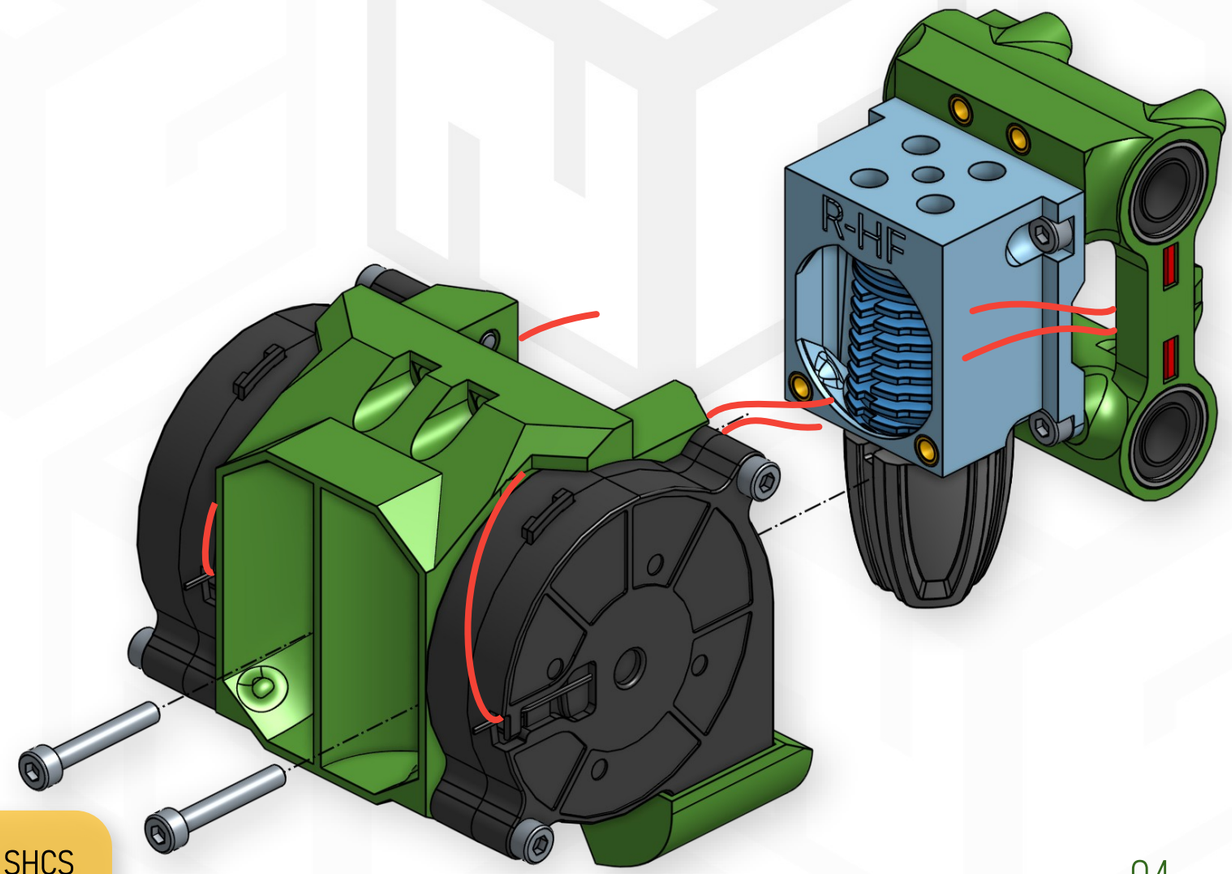


TIP: HOTEND WIRING

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.



M3x20 SHCS

TOOLHEAD FANDUCT

CPAP COOLING

TOOLS:

Glue for plastics
2.5 mm Allen key

HARDWARE:

2x M3x16 SHCS

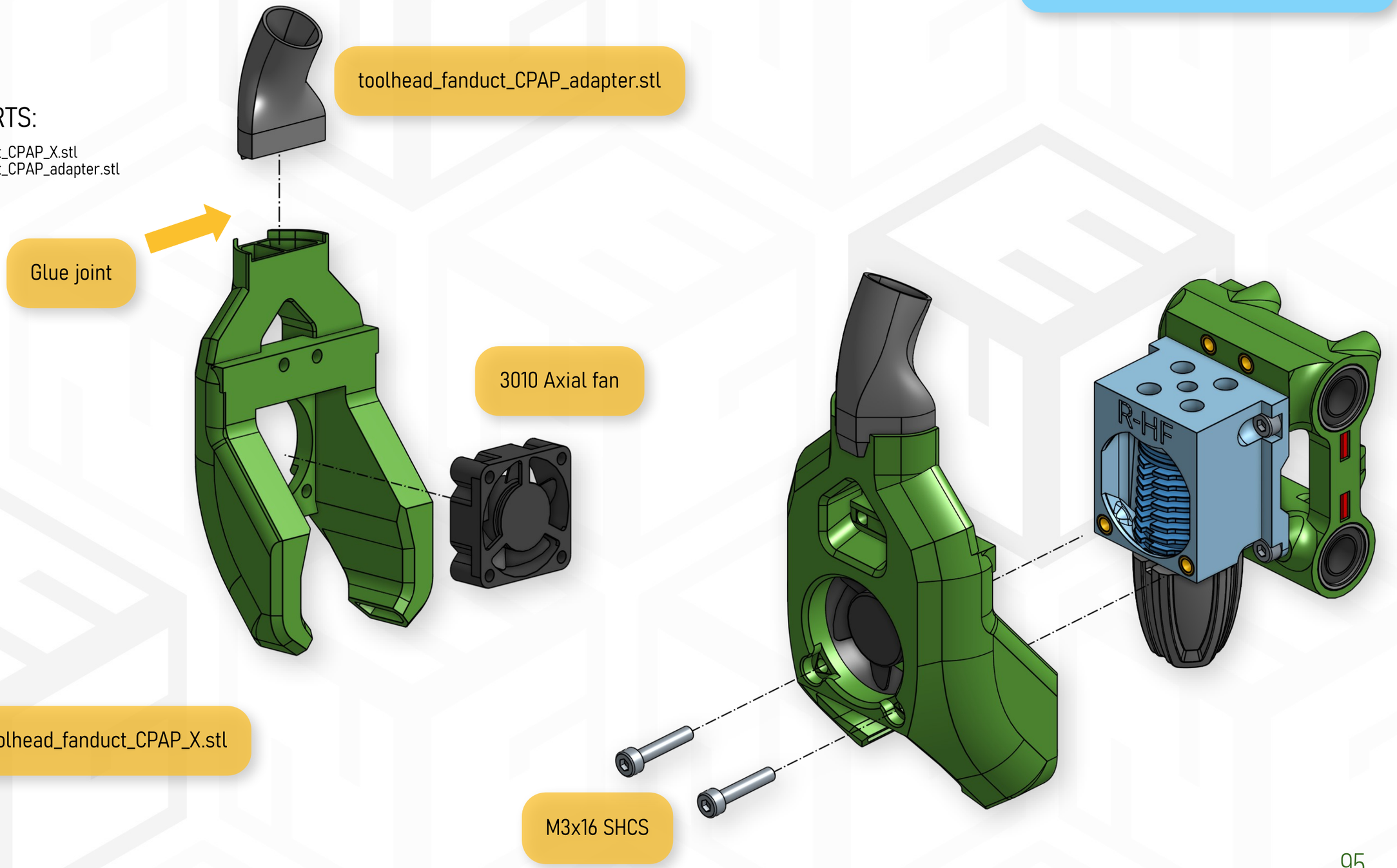
3010 axial fan

PRINTED PARTS:

toolhead_fanduct_CPAP_X.stl
toolhead_fanduct_CPAP_adapter.stl

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.



TOOLHEAD EXTRUDER

TOOLS:

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

HARDWARE:

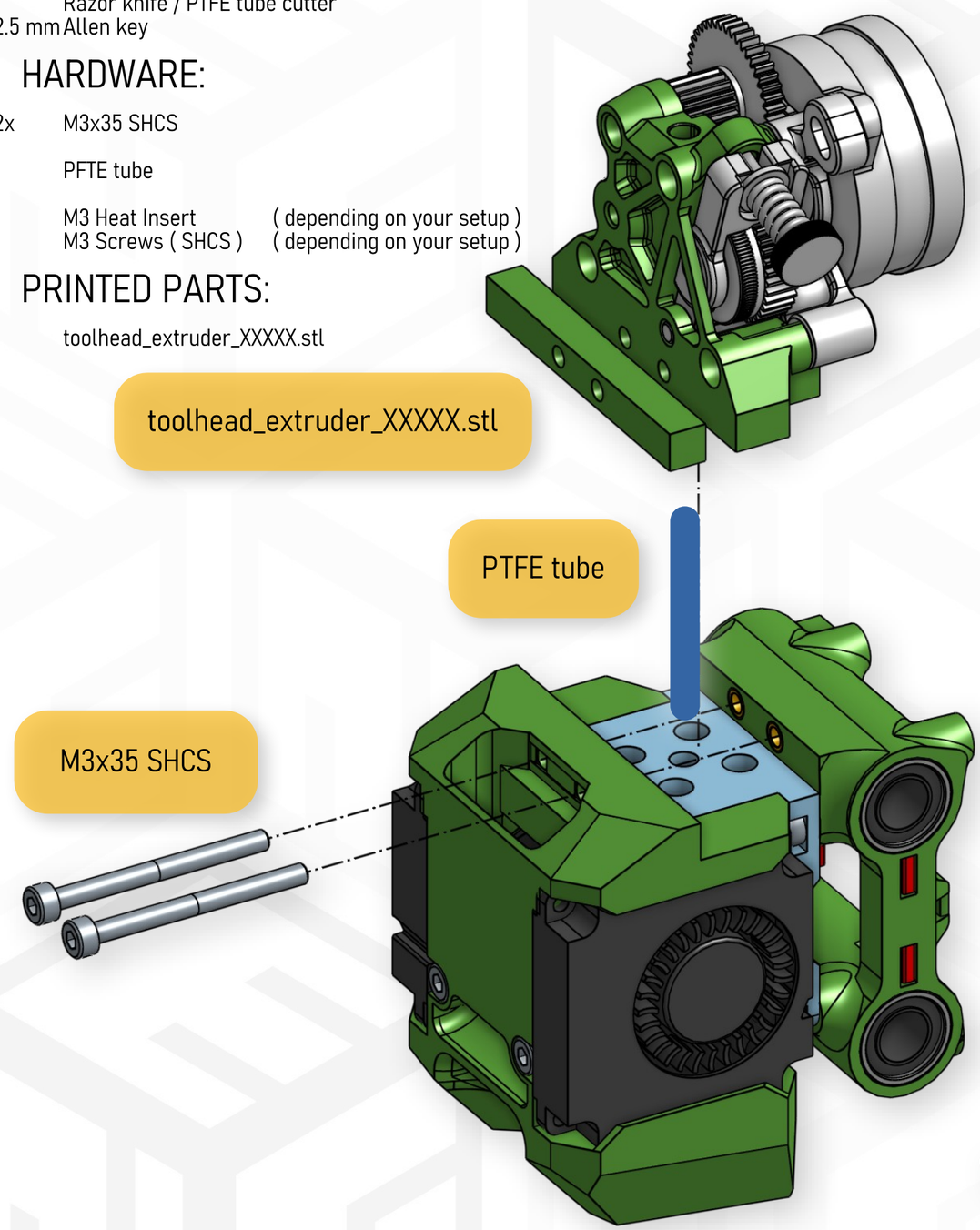
2x M3x35 SHCS

PFTE tube

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

PRINTED PARTS:

toolhead_extruder_XXXXX.stl



TIP: PTFE TUBE LENGTH

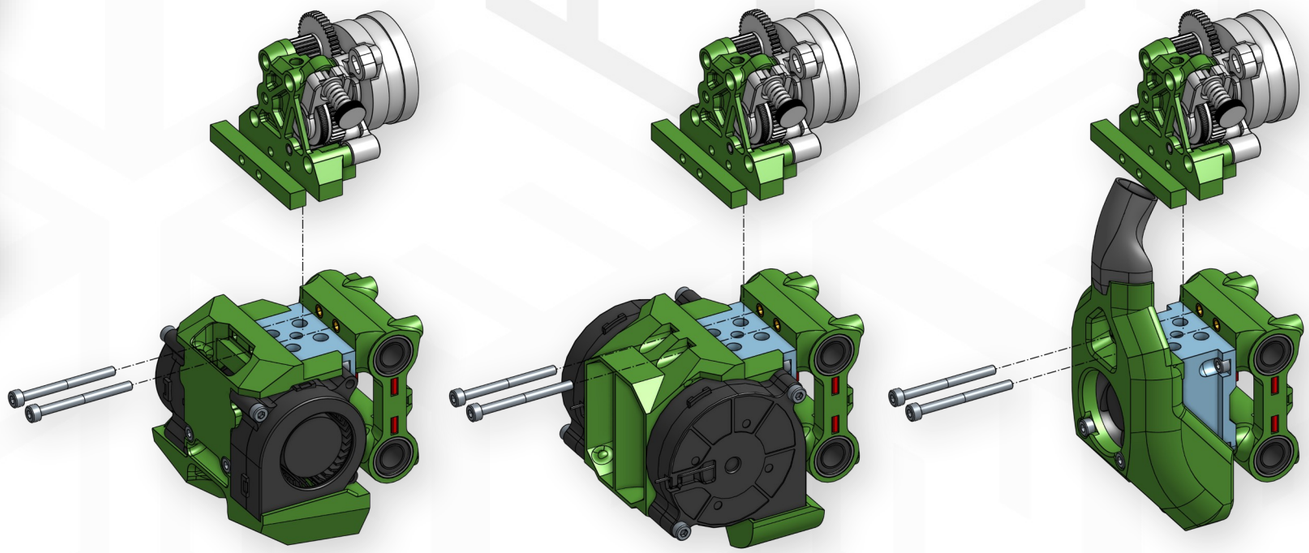
To measure the required PTFE tube length, first insert it into the hotend part, mark the end position and measure the length. Do the same with the extruder.
The final length is the sum of both + 0.5 mm.

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.



TOOLHEAD BED PROBE

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:

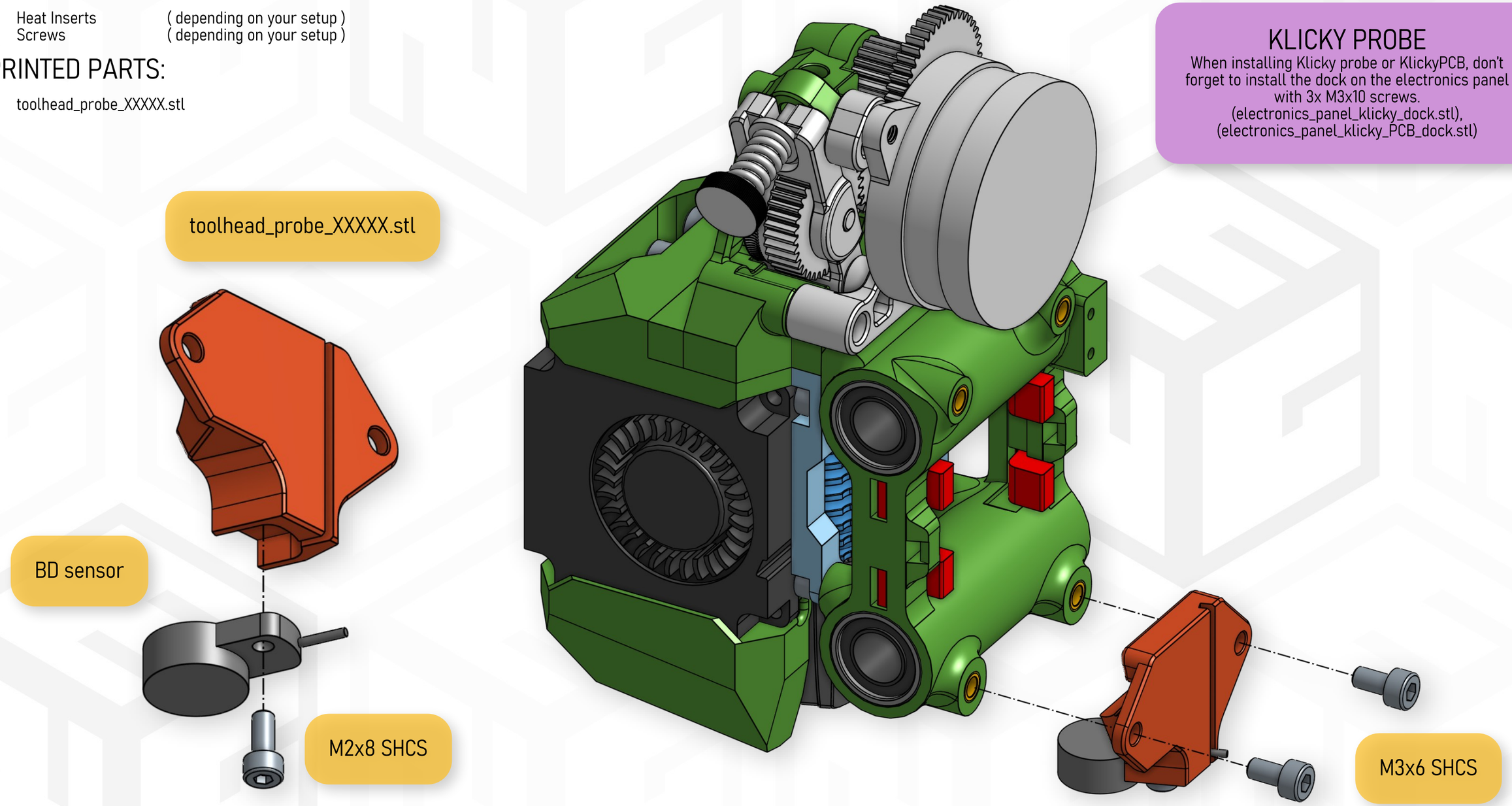
toolhead_probe_XXXXX.stl

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 Klicky probe or KlickyPCB, don't forget to install the dock on the electronics panel with 3x M3x10 screws.
(electronics_panel_klicky_dock.stl),
(electronics_panel_klicky_PCB_dock.stl)



TOOLHEAD ACCESSORIES (OPTIONAL)

TOOLS:

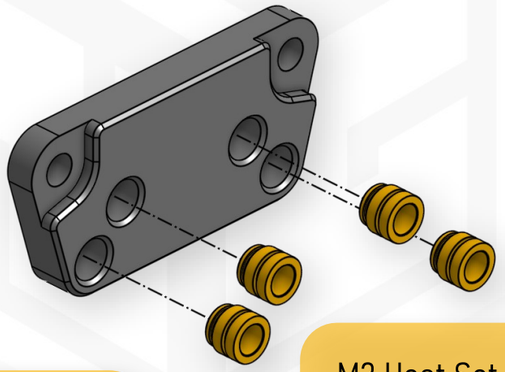
	Heat set insert press	(depending on your setup)
	Superglue	(depending on your setup)
2.5 mm	Allen key	

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



M3 Heat Set Inserts

toolhead_accessories_accelerometer.stl

ACCELEROMETER MOUNT

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

CABLE HOLDER

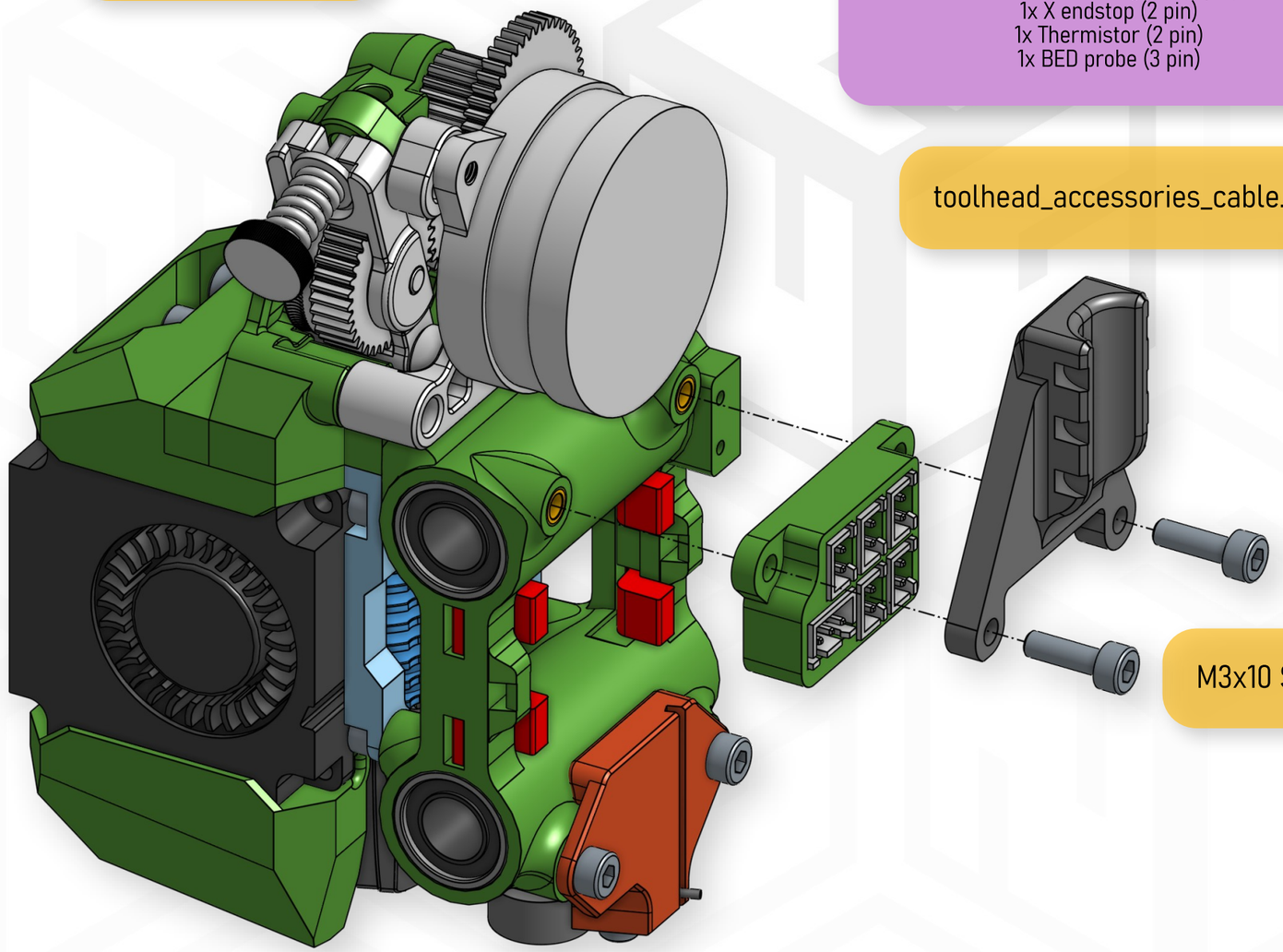
For easier cable management, Use zipties to secure the wire loom.

CABLE BREAKOUT

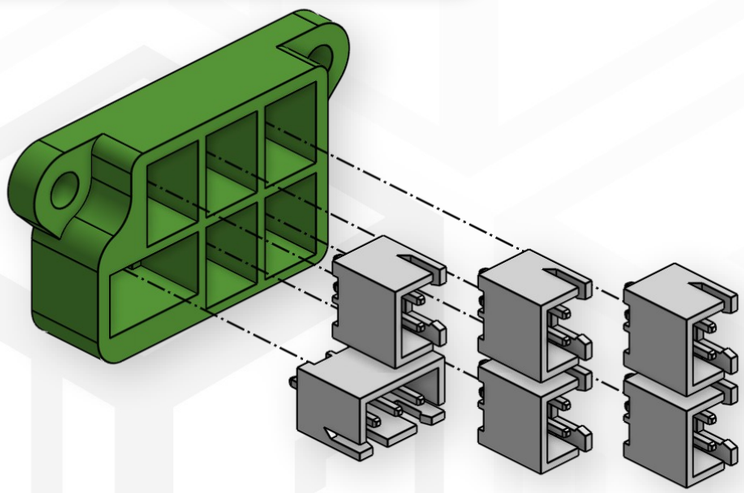
Glue the JST XH connectors in place and solder The wire loom from the other side. Helps with toolhead maintenance.

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



toolhead_accessories_breakout.stl



M3x10 SHCS

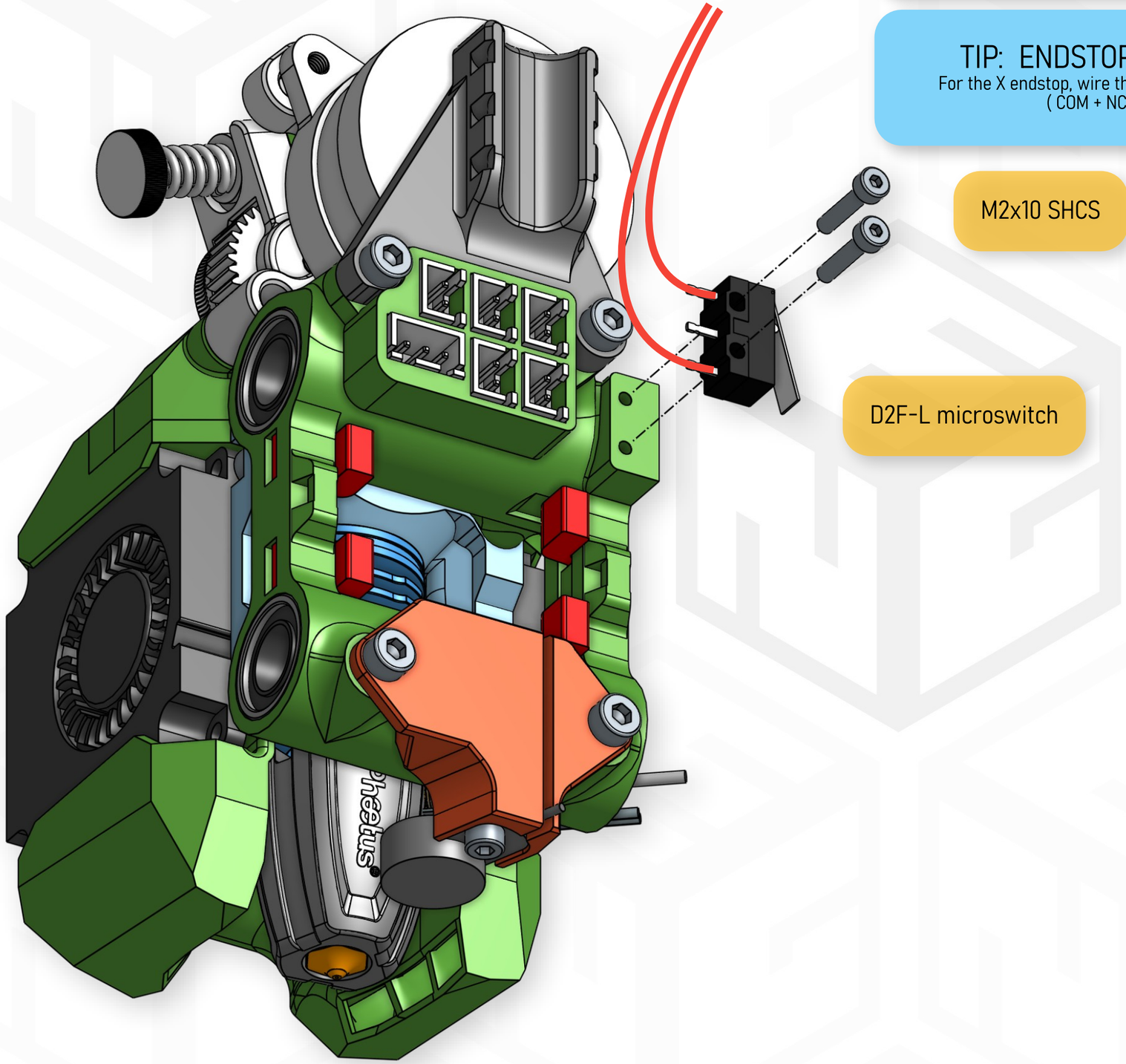
TOOLHEAD
X ENDSTOP

TOOLS:

1.5 mm Allen key

HARDWARE:

2x M2x10 SHCS
D2F-L Microswitch



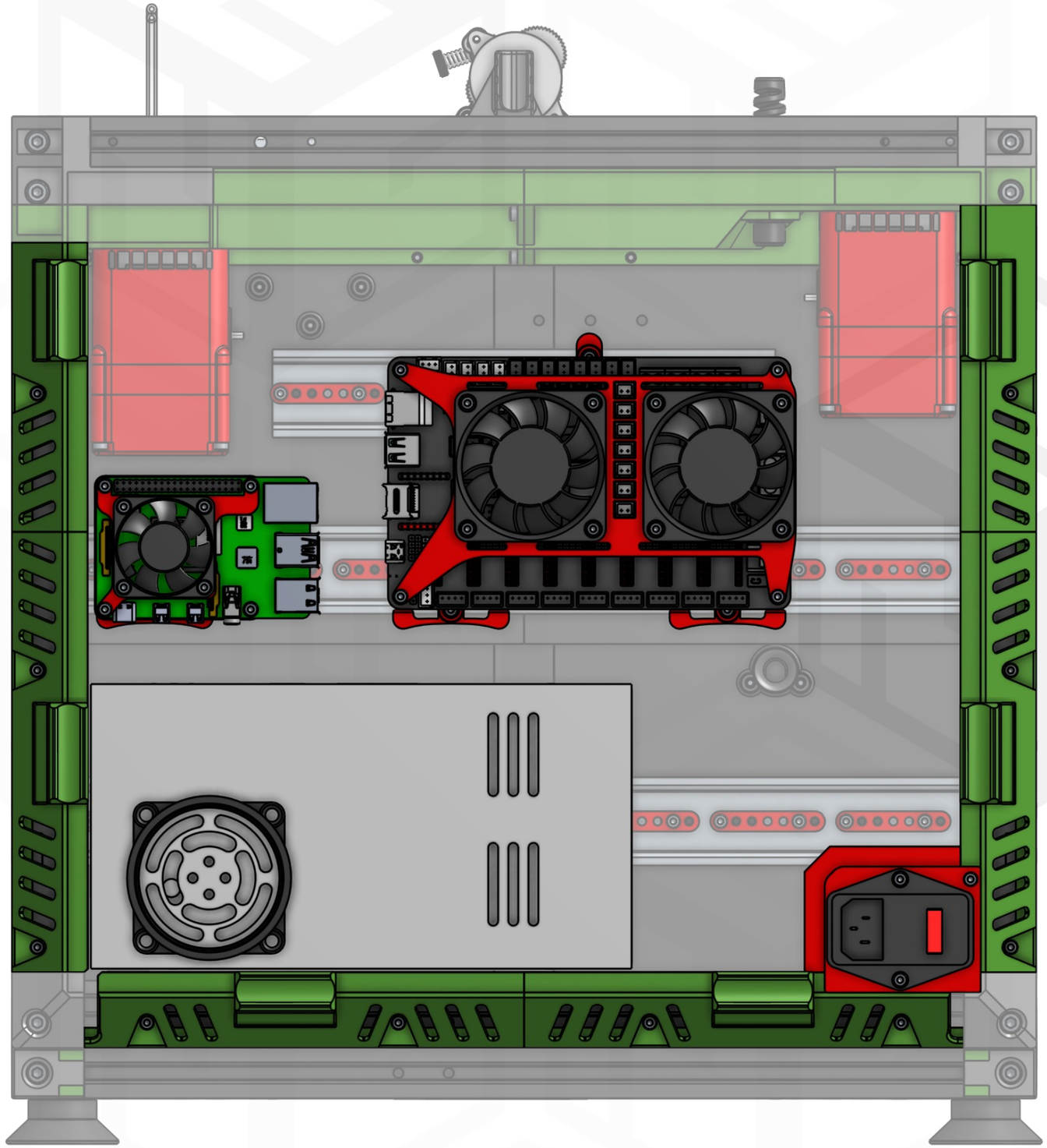
WARNING: CAREFUL
Be careful when tighteningh the M2 screws as they screw directly into the plastic.

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

M2x10 SHCS

D2F-L microswitch

ELECTRONICS



ELECTRONICS AIR VENT

LATCH INSTALL

TOOLS:

2.5 mm Allen key

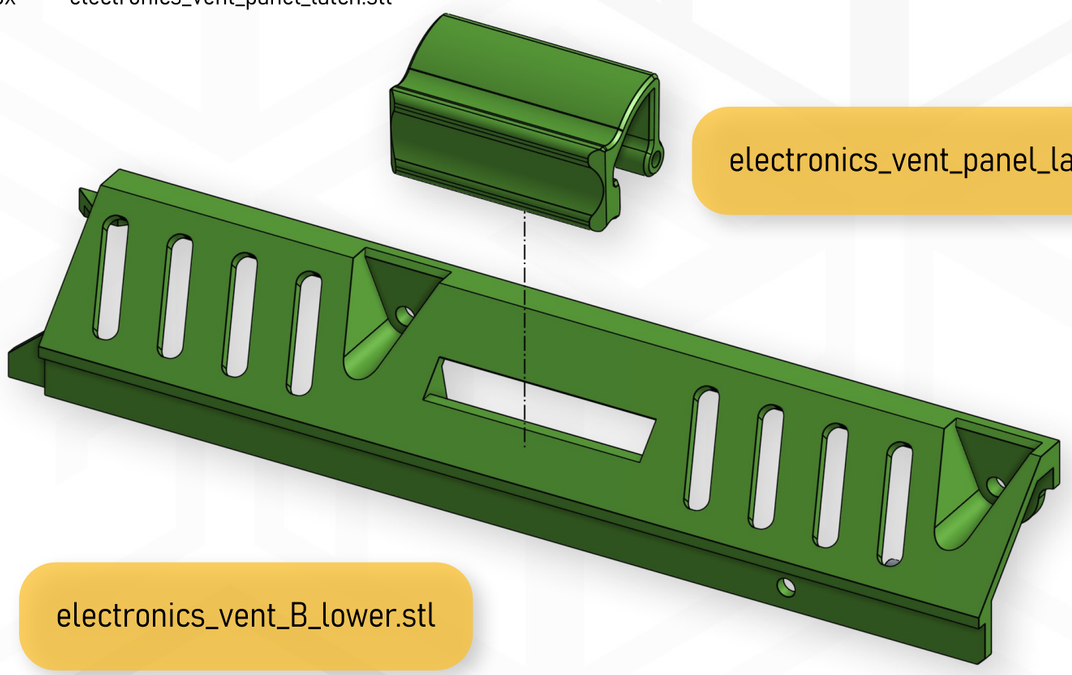
HARDWARE:

12x M3x10 SHCS

PRINTED PARTS:

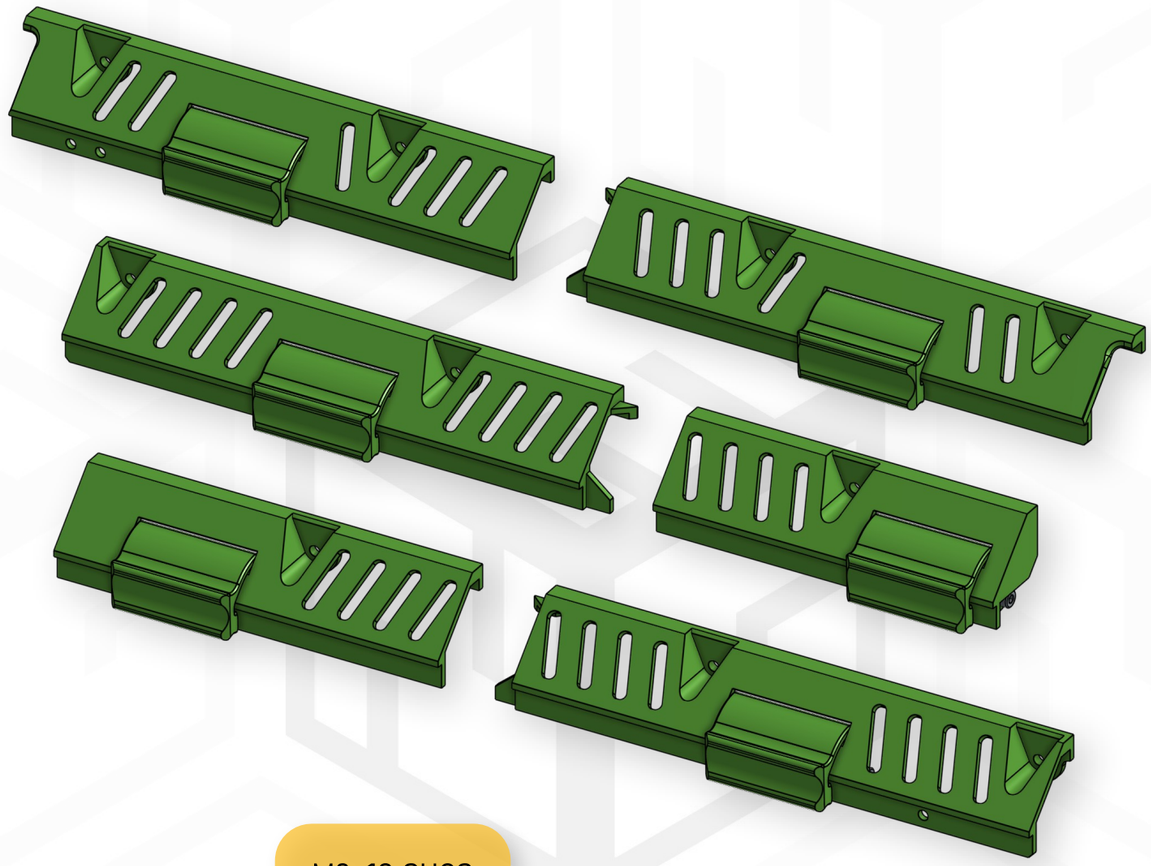
electronics_vent_A_lower.stl
electronics_vent_A_upper.stl
electronics_vent_B_lower.stl
electronics_vent_B_upper.stl
electronics_vent_bottom_left.stl
electronics_vent_bottom_right.stl
6x electronics_vent_panel_latch.stl

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



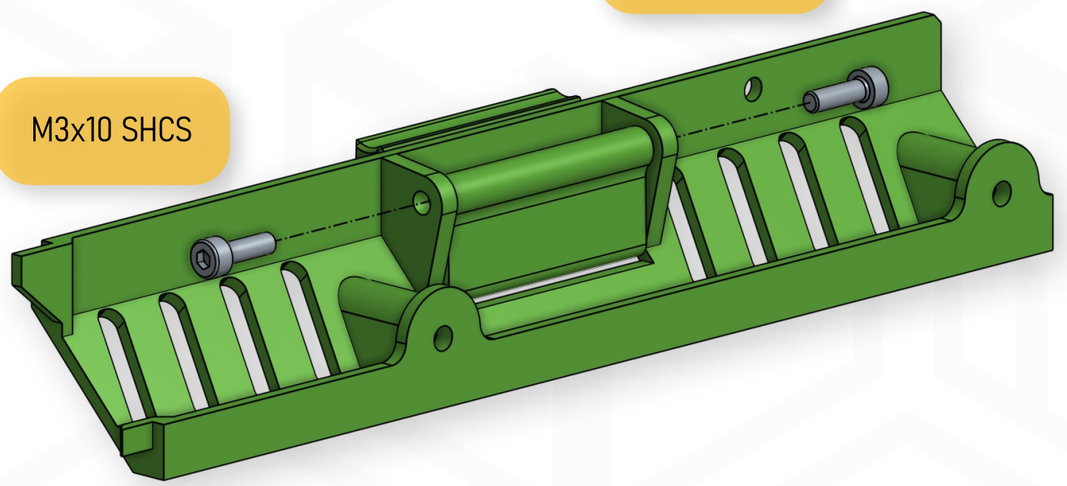
electronics_vent_panel_latch.stl

electronics_vent_B_lower.stl



M3x10 SHCS

M3x10 SHCS



ELECTRONICS AIR VENTS

GLUEUP AND FASTENERS

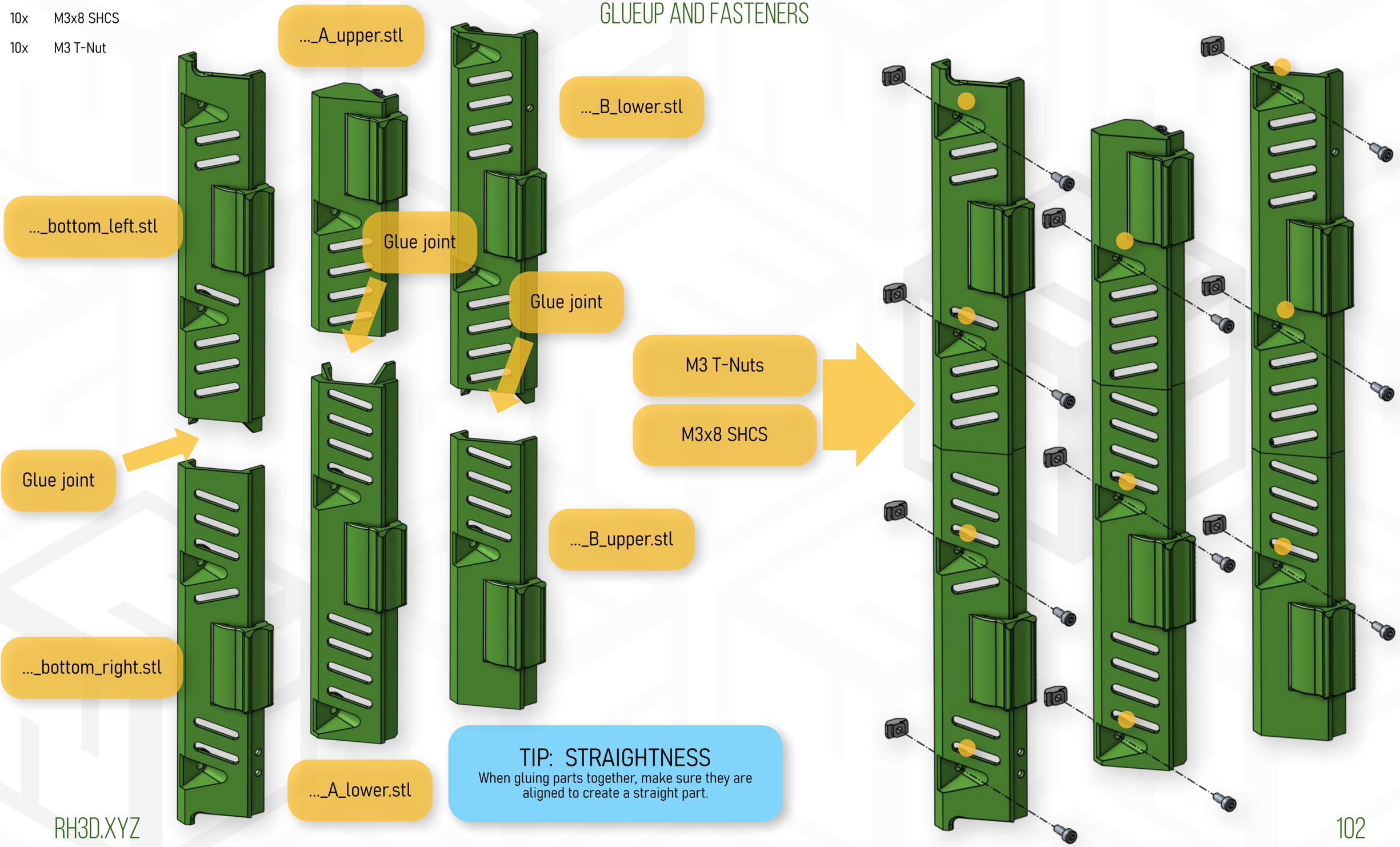
TOOLS:

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

HARDWARE:

10x M3x8 SHCS

10x M3 T-Nut



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

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

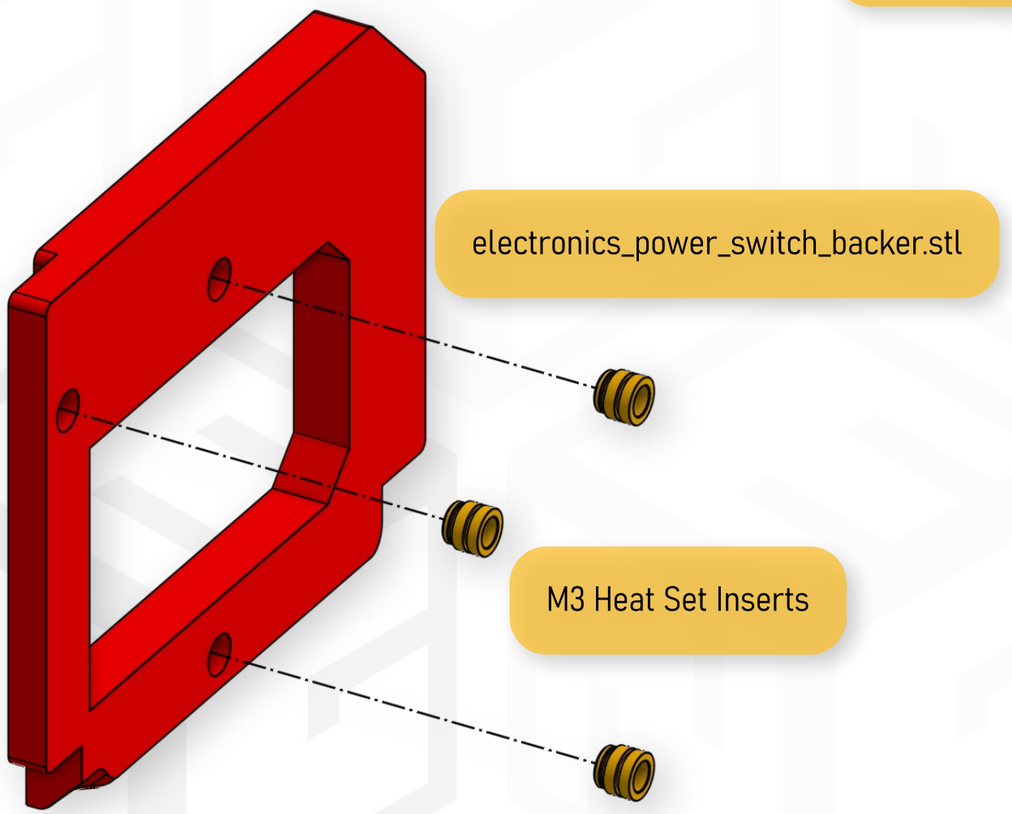
1x M3 T-Nut
1x M4 T-Nut

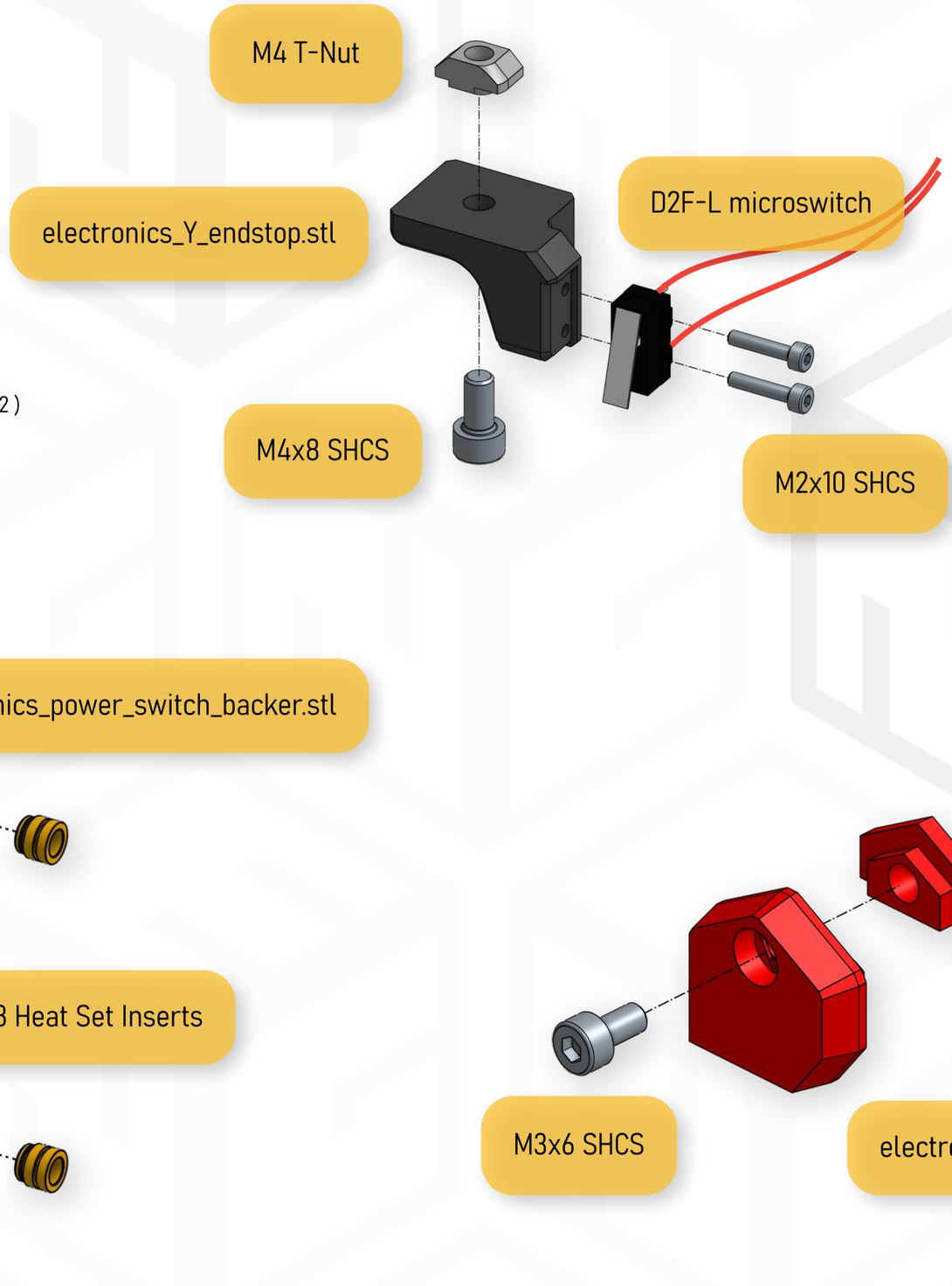
D2F-L Microswitch

PRINTED PARTS:

electronics_power_switch_backer.stl
OR electronics_power_switch_e3v2_backer.stl (for Ender 3 V2)

electronics_panel_cable_cover_right.stl
electronics_panel_cable_cover_backer.stl

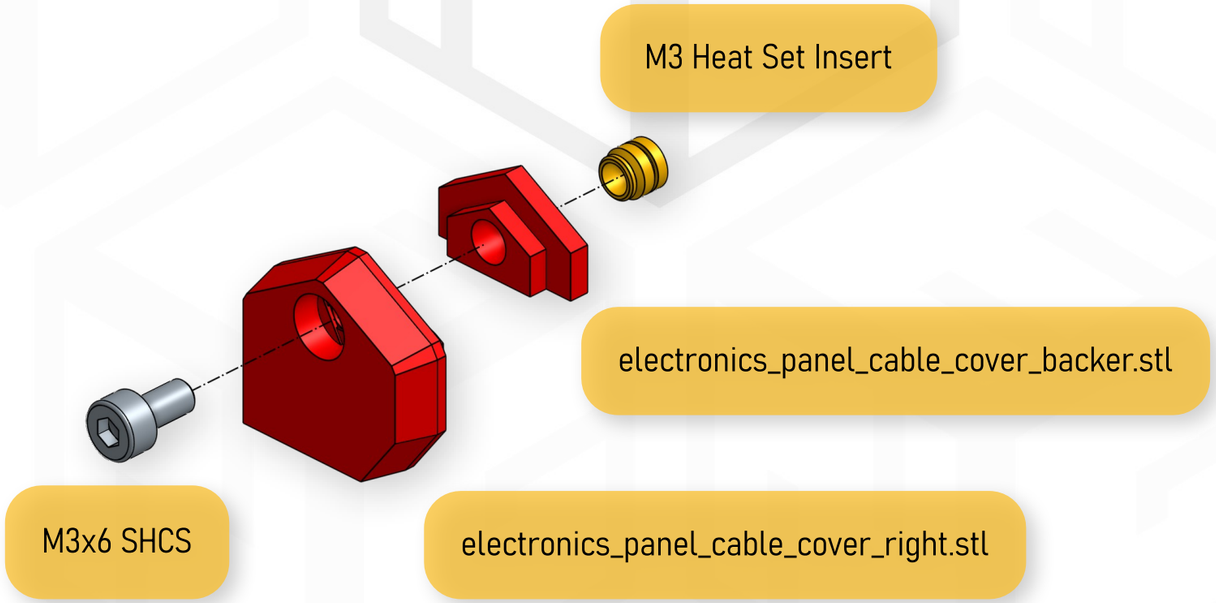




WARNING: CAREFUL
Be careful when tighteningh the M2 screws as they screw directly into the plastic.

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

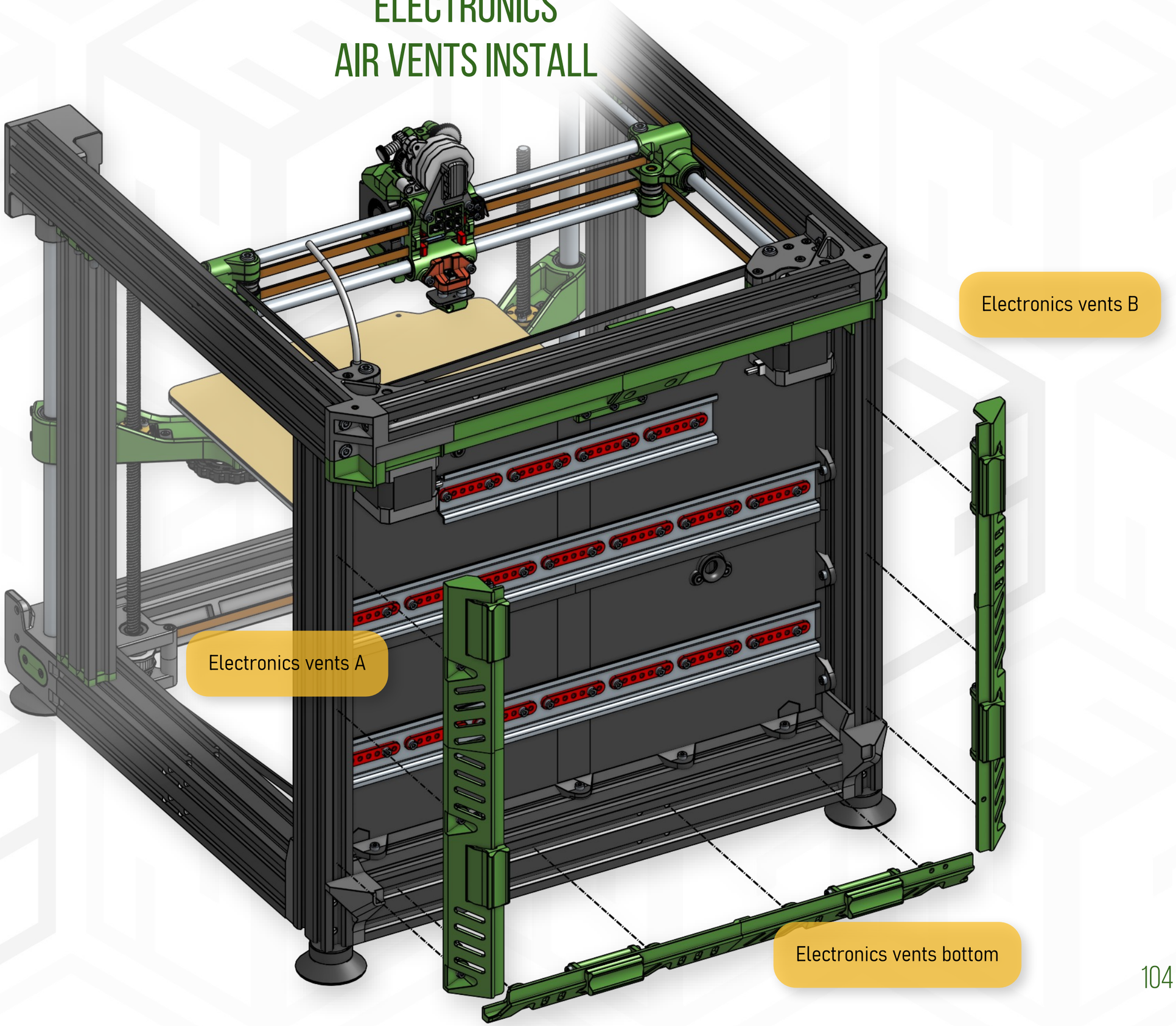
1 VS 2 CABLE COVERS
Based on your decision (pg.68), either assemble only the right cable cover or both left and right.
Installation process for both sides is the same.



TOOLS:

2.5 mm Allen key

ELECTRONICS
AIR VENTS INSTALL

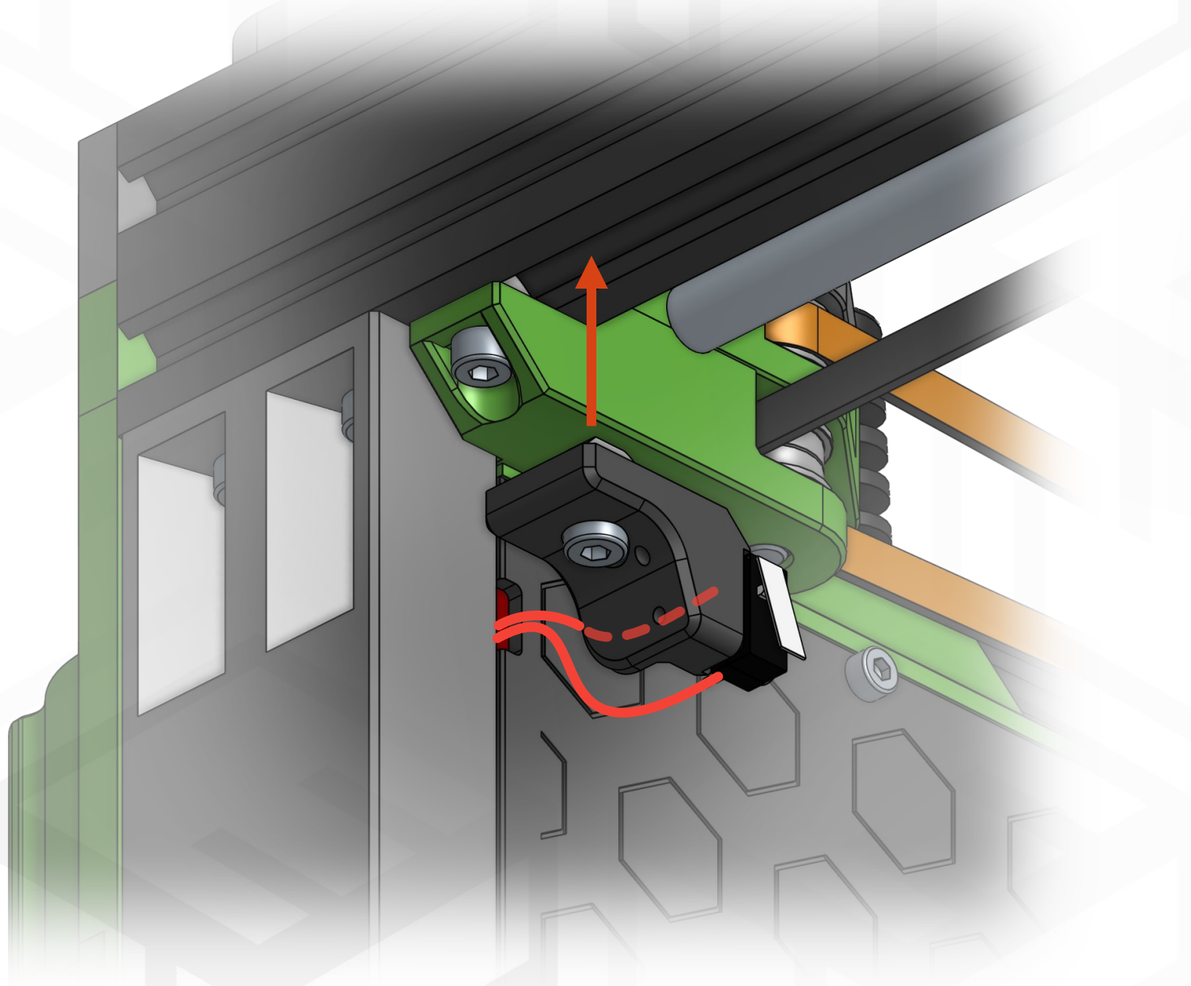


TOOLS:

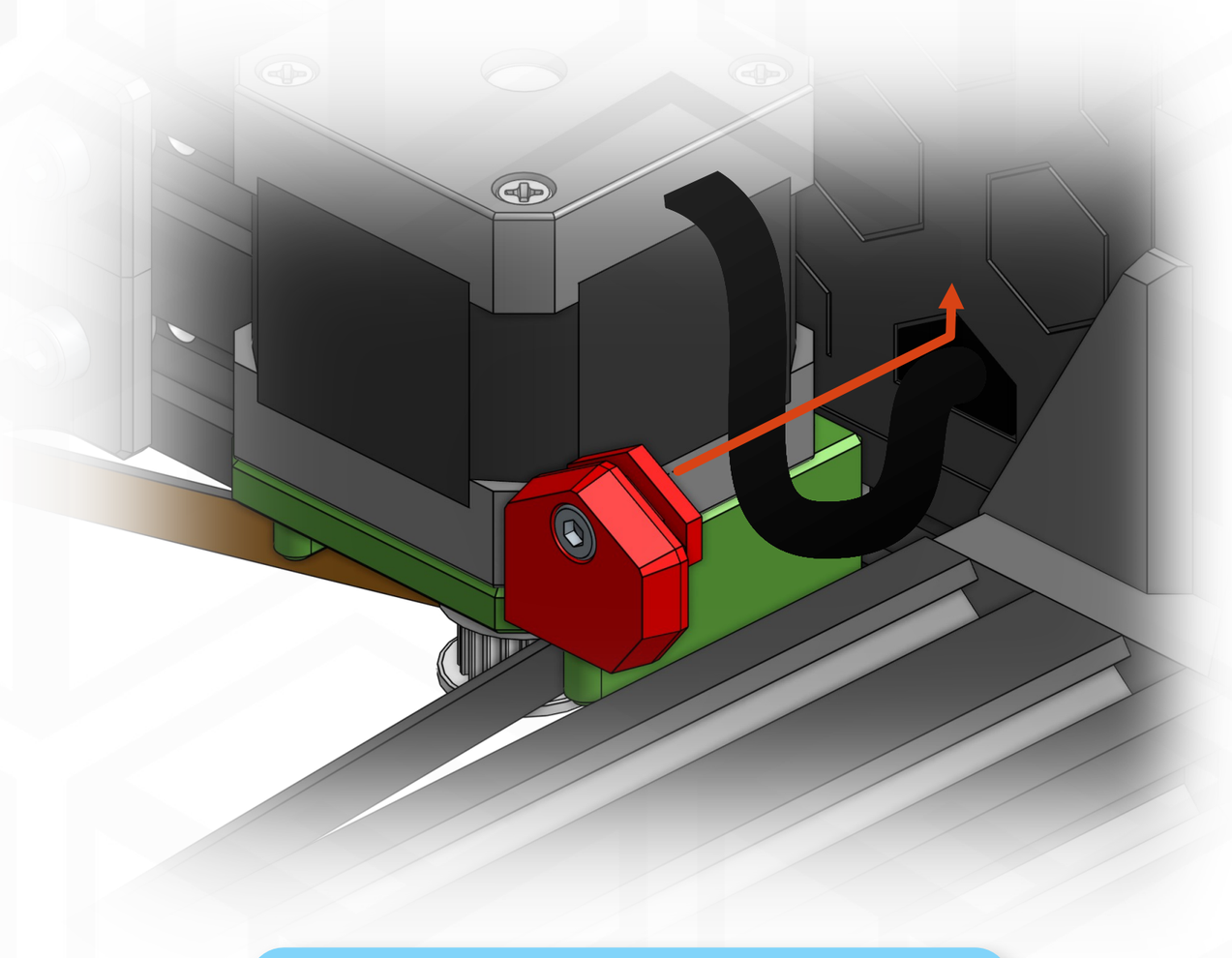
2.5 mm Allen key
3 mm Allen key

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.

ELECTRONICS
POWER INLET + CABLE GLAND

TOOLS:

2.5 mm Allen key

HARDWARE:

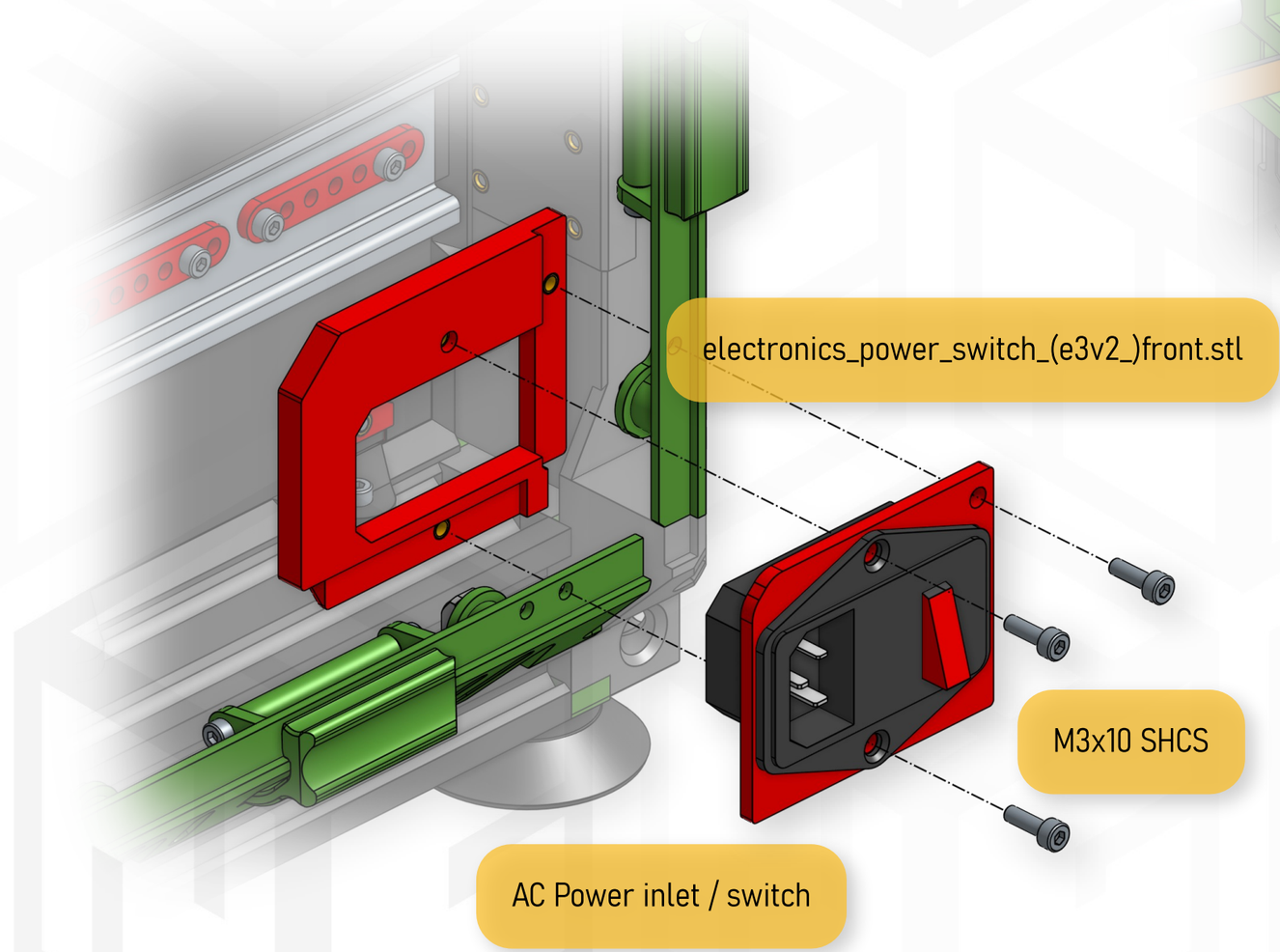
3x M3x10 SHCS

Ziptie
AC Power inlet / switch

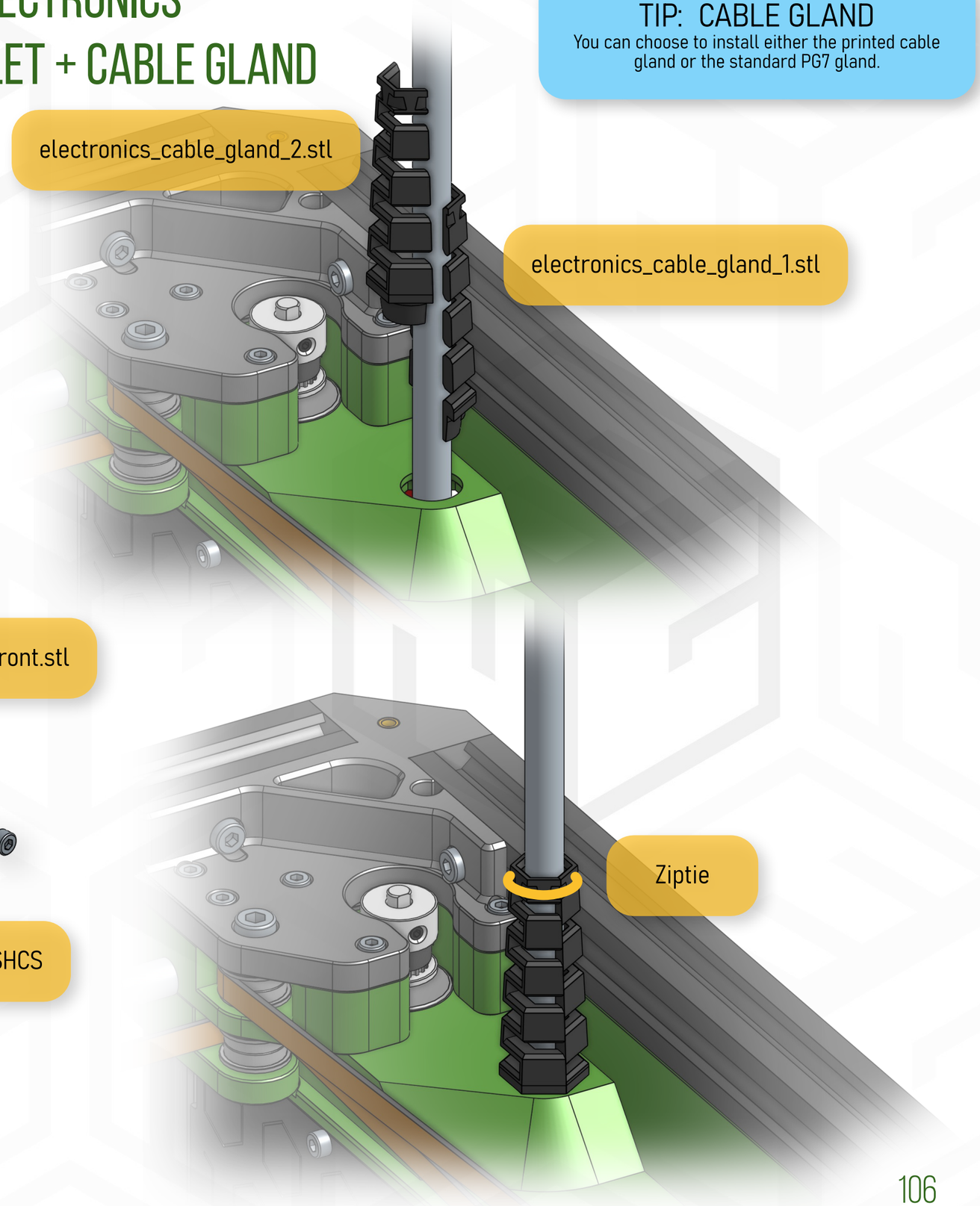
PRINTED PARTS:

electronics_power_switch_front.stl
OR electronics_power_switch_e3v2_front.stl (for Ender 3 V2)

electronics_cable_gland_1.stl
electronics_cable_gland_2.stl



TIP: CABLE GLAND
You can choose to install either the printed cable gland or the standard PG7 gland.



ELECTRONICS
POWER SUPPLY

TOOLS:

3 mm Allen key

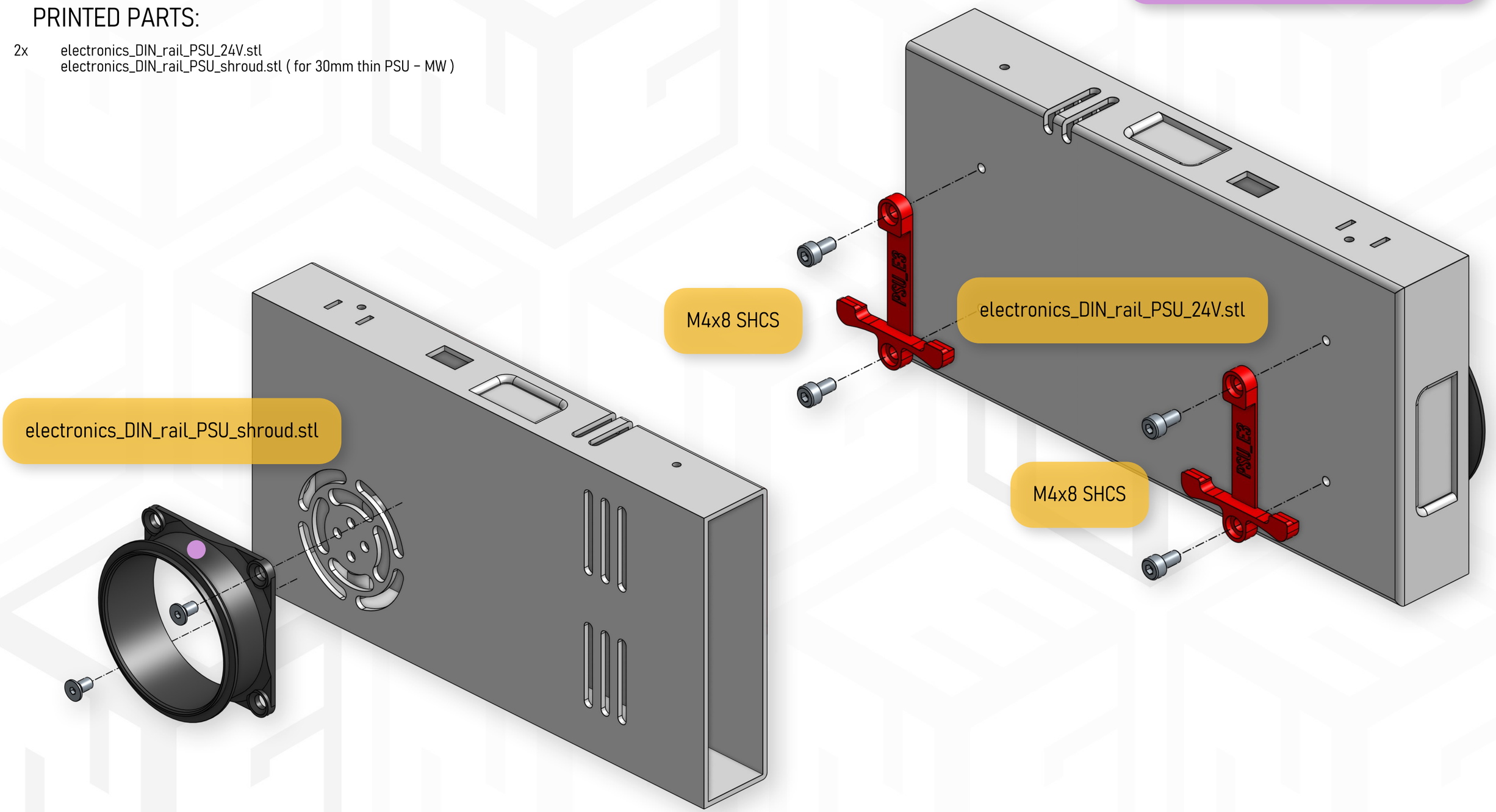
HARDWARE:

4x M4x8 SHCS

PRINTED PARTS:

2x electronics_DIN_rail_PSU_24V.stl
electronics_DIN_rail_PSU_shroud.stl (for 30mm thin PSU – MW)

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.



ELECTRONICS MOTHERBOARD

E3 BOARDS

TOOLS:

2.5 mm Allen key

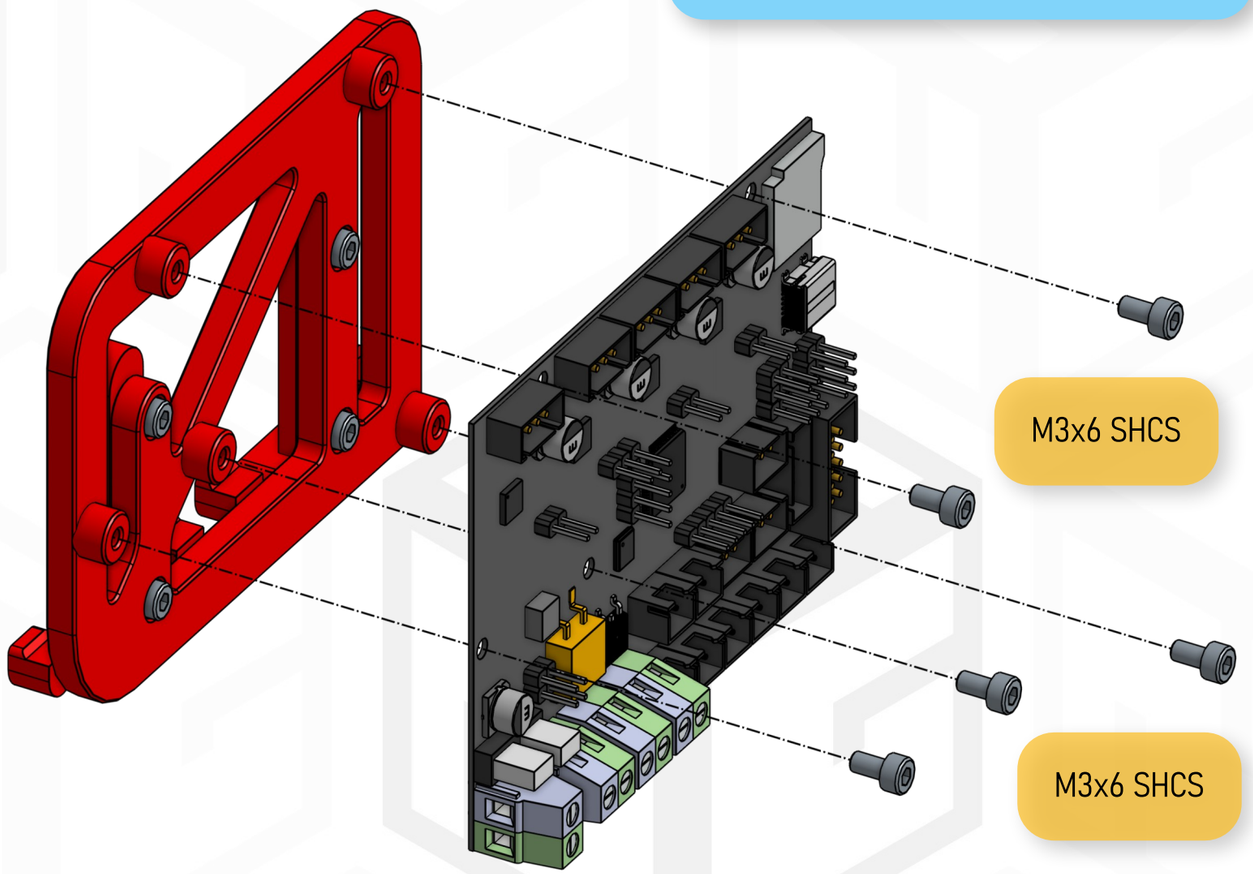
HARDWARE:

9x M3x6 SHCS

PRINTED PARTS:

2x electronics_DIN_rail_generic_mount.stl
electronics_DIN_BTT_SKRminiE3_mount.stl

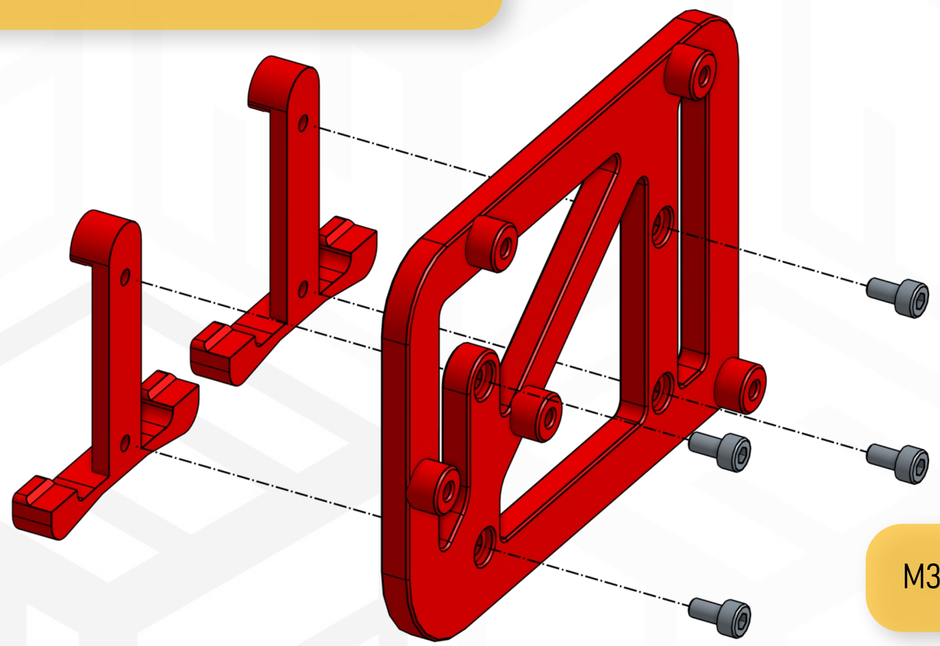
TIP: BOARD COMPATIBILITY
In the build manual you will find two examples for motherboard mounting but with the DIN rails it is very easy to install almost any board.



M3x6 SHCS

M3x6 SHCS

electronics_DIN_rail_generic_mount.stl



M3x6 SHCS

electronics_DIN_BTT_SKRminiE3_mount.stl

ELECTRONICS COOLING

UNIVERSAL

TOOLS:

Heat set insert press
2.5 mm Allen key

HARDWARE:

8x Heat set inserts

8x M3x20 SHCS

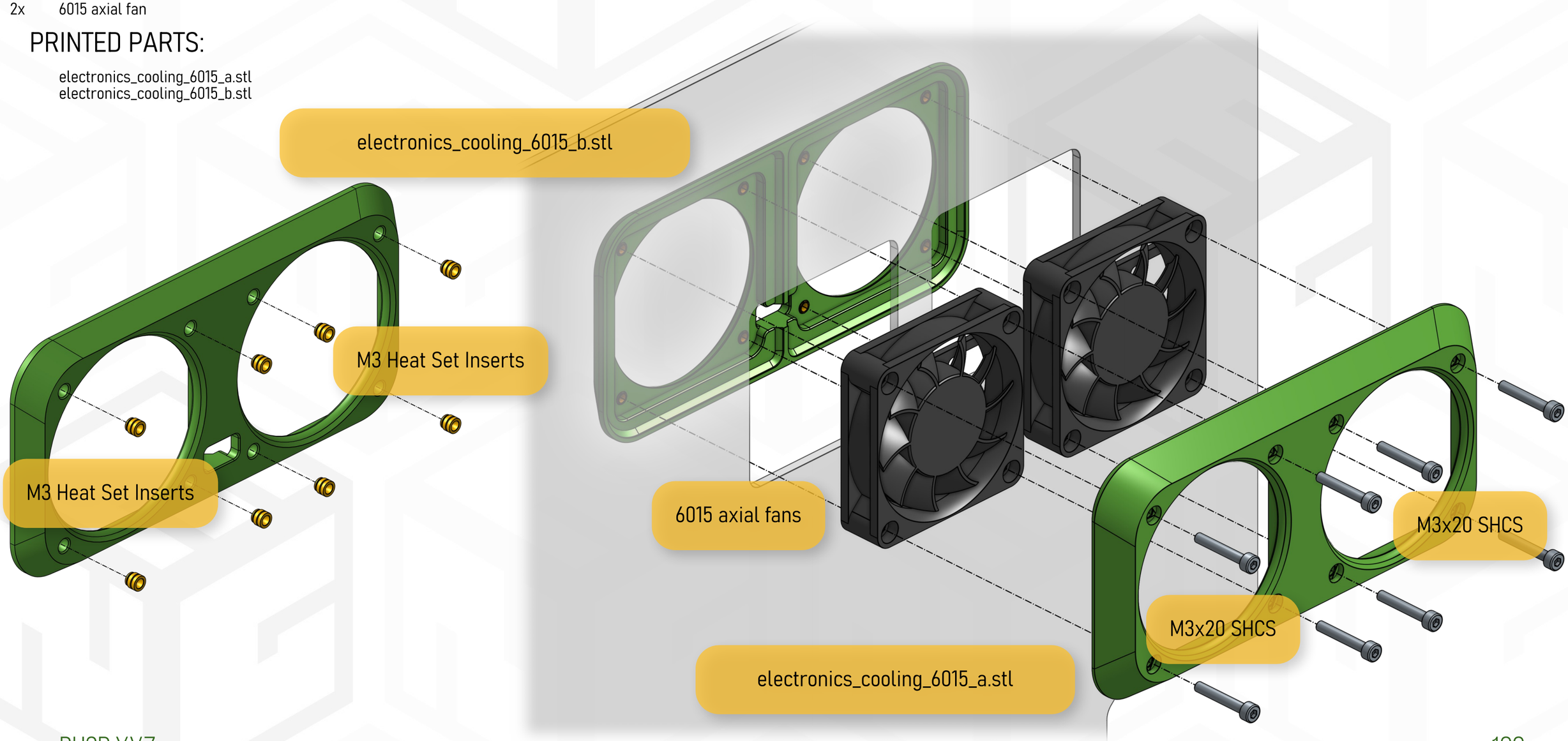
2x 6015 axial fan

PRINTED PARTS:

electronics_cooling_6015_a.stl
electronics_cooling_6015_b.stl

TIP: COOLING OPTIONS

This is an universal cooling option where fans mount onto the panel and you can position the elecronics in almost any way.
On the next example (BTT Octopus), you will see the cooling being directly mounted onto the motherboard.



ELECTRONICS MOTHERBOARD

BTT OCTOPUS

TOOLS:

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

HARDWARE:

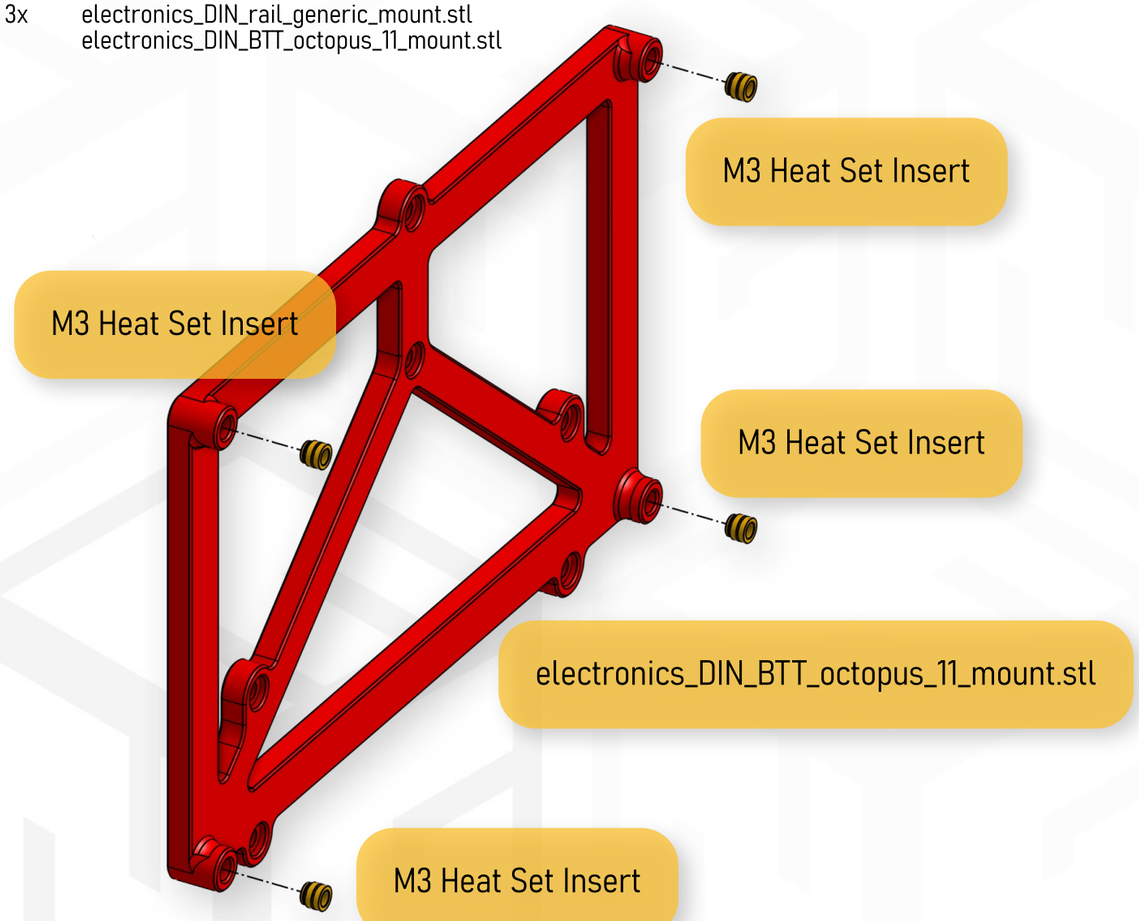
4x M3 Heat set insert

6x M3x6 SHCS

7x JST XH 2pin (optional)

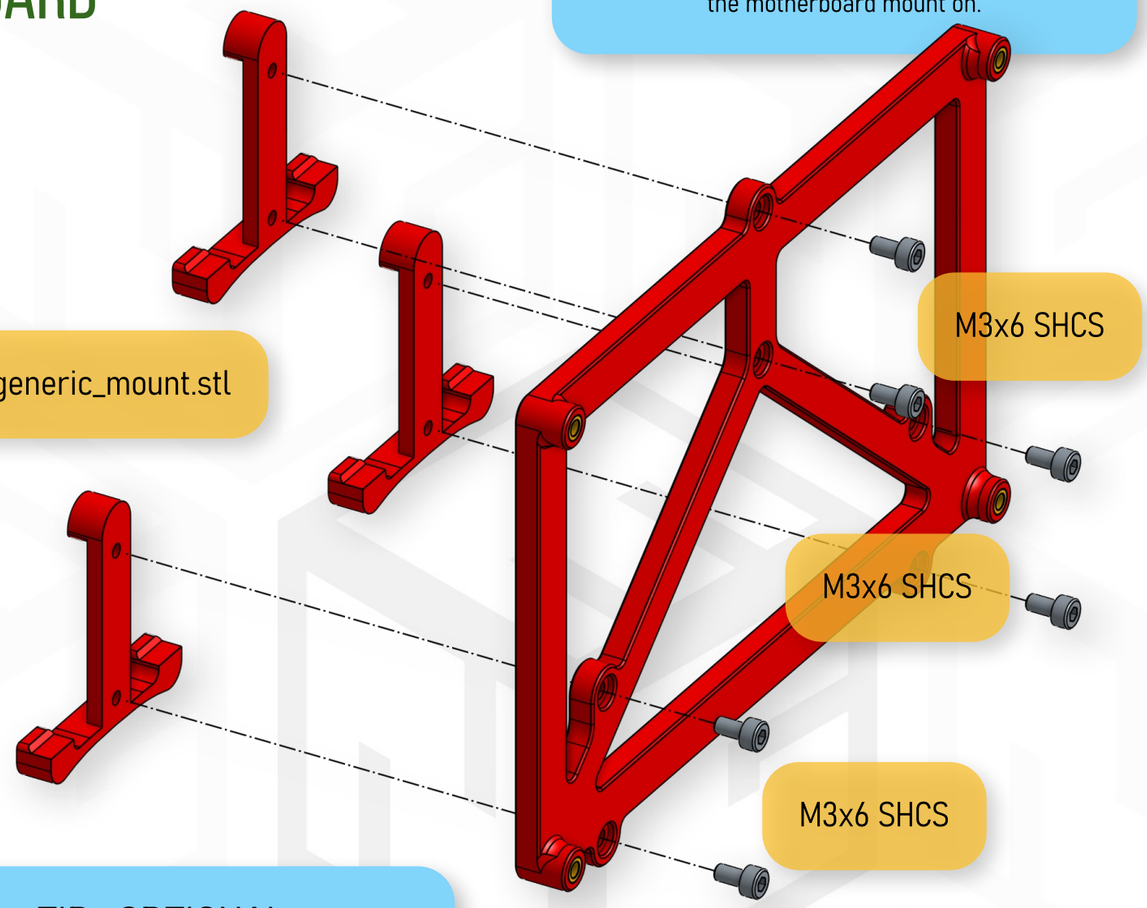
PRINTED PARTS:

3x electronics_DIN_rail_generic_mount.stl
electronics_DIN_BTT_octopus_11_mount.stl

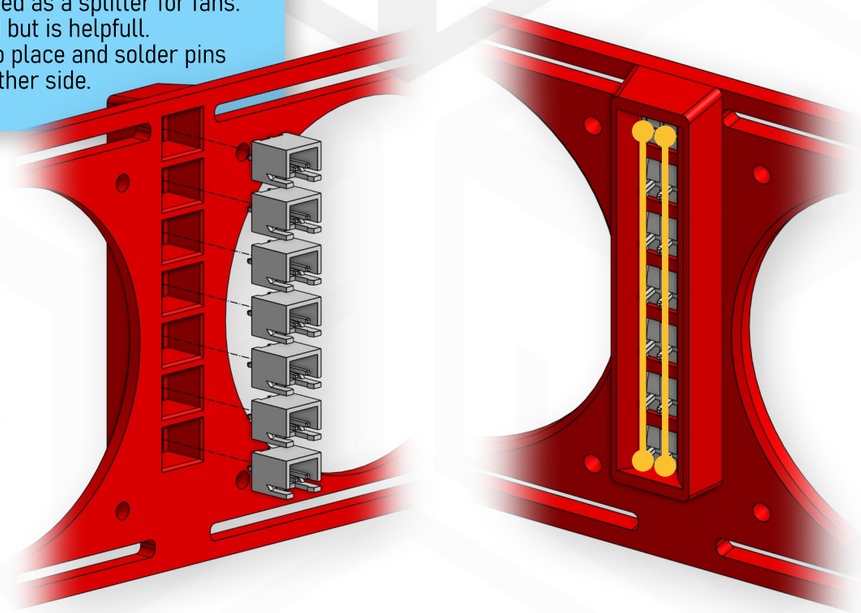


TIP: MOTHERBOARD INSTALL
For easier assembly, you might install the DIN rail mounts onto the DIN rail first before screwing the motherboard mount on.

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.



ELECTRONICS
MOTHERBOARD

BTT OCTOPUS

TOOLS:

2.5 mm Allen key

HARDWARE:

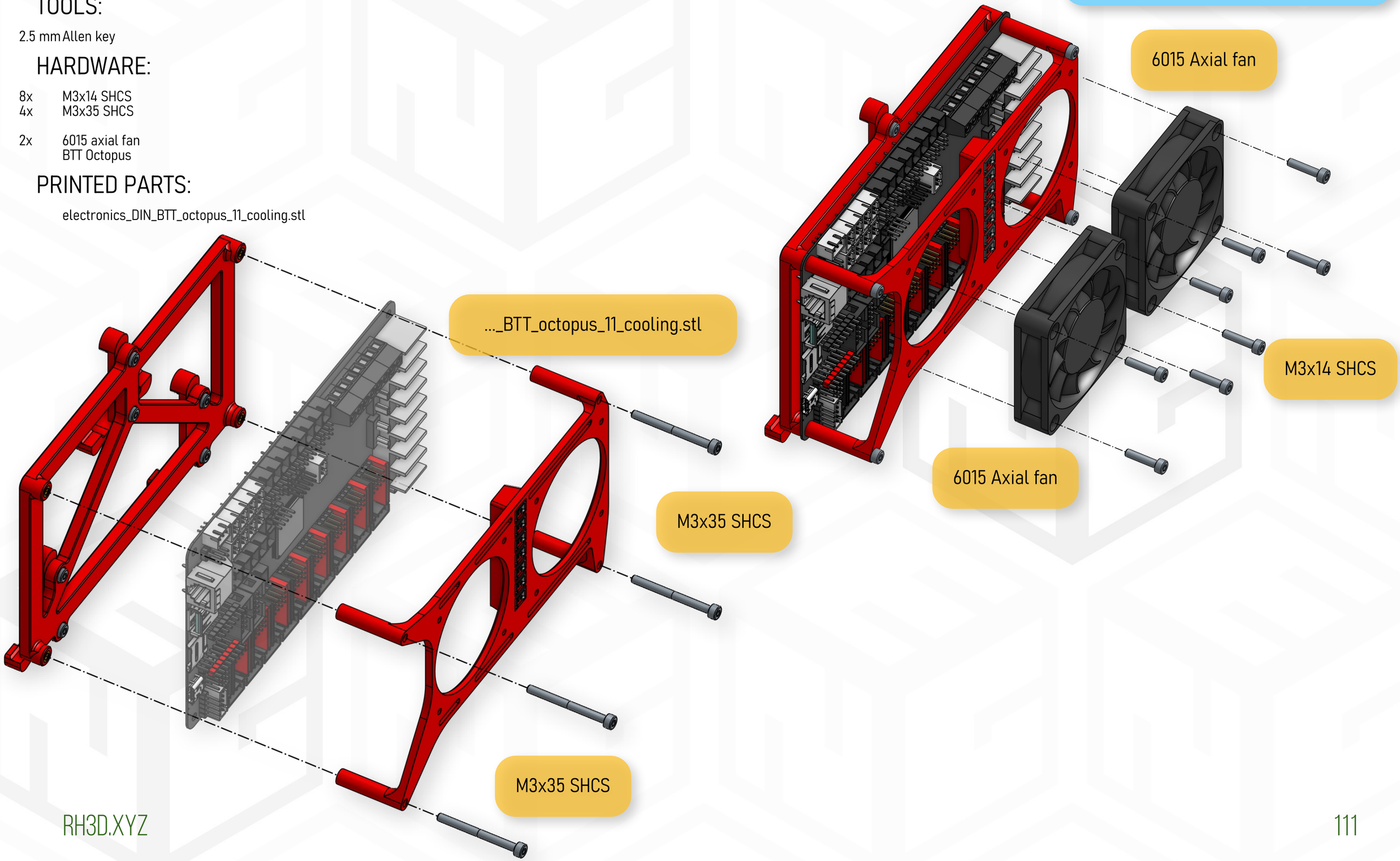
8x M3x14 SHCS
4x M3x35 SHCS

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:

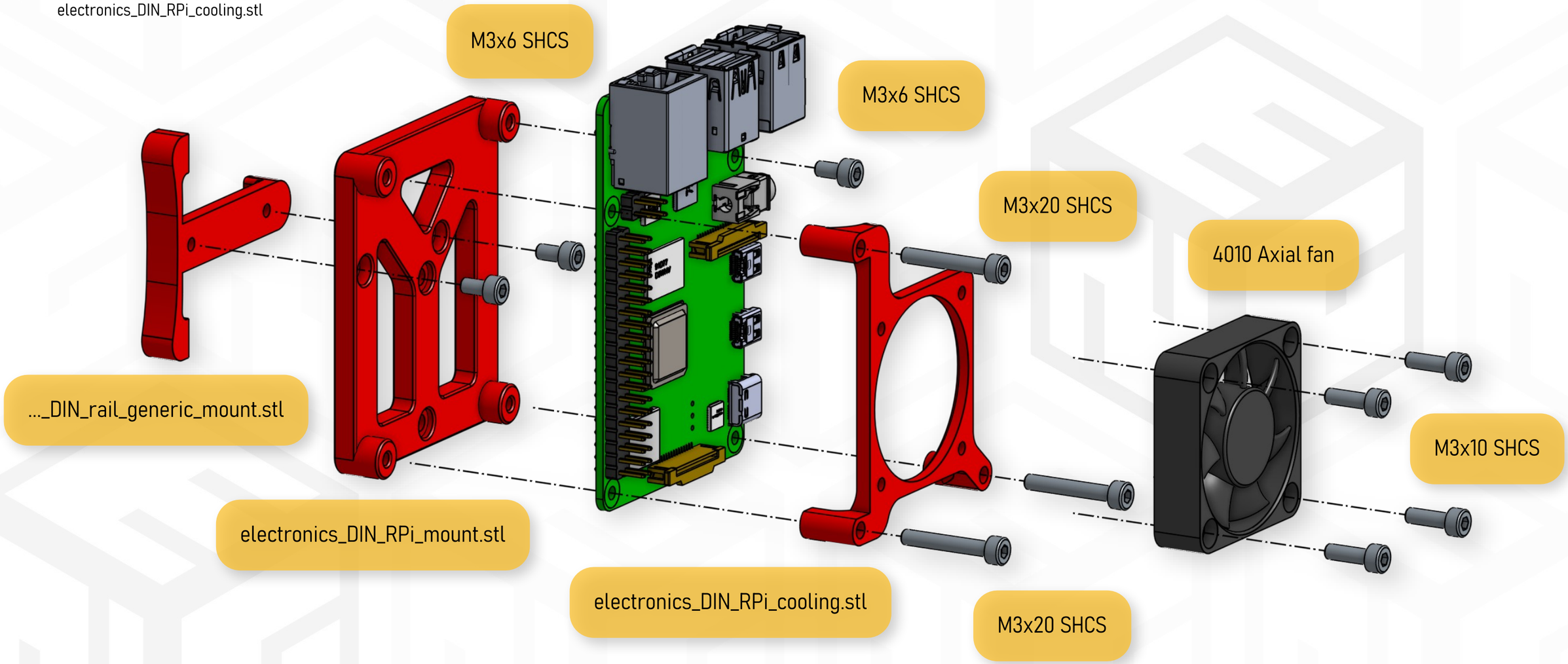
3x M3x6 SHCS
4x M3x10 SHCS
3x M3x20 SHCS

4010 axial fan
Raspberry Pi

PRINTED PARTS:

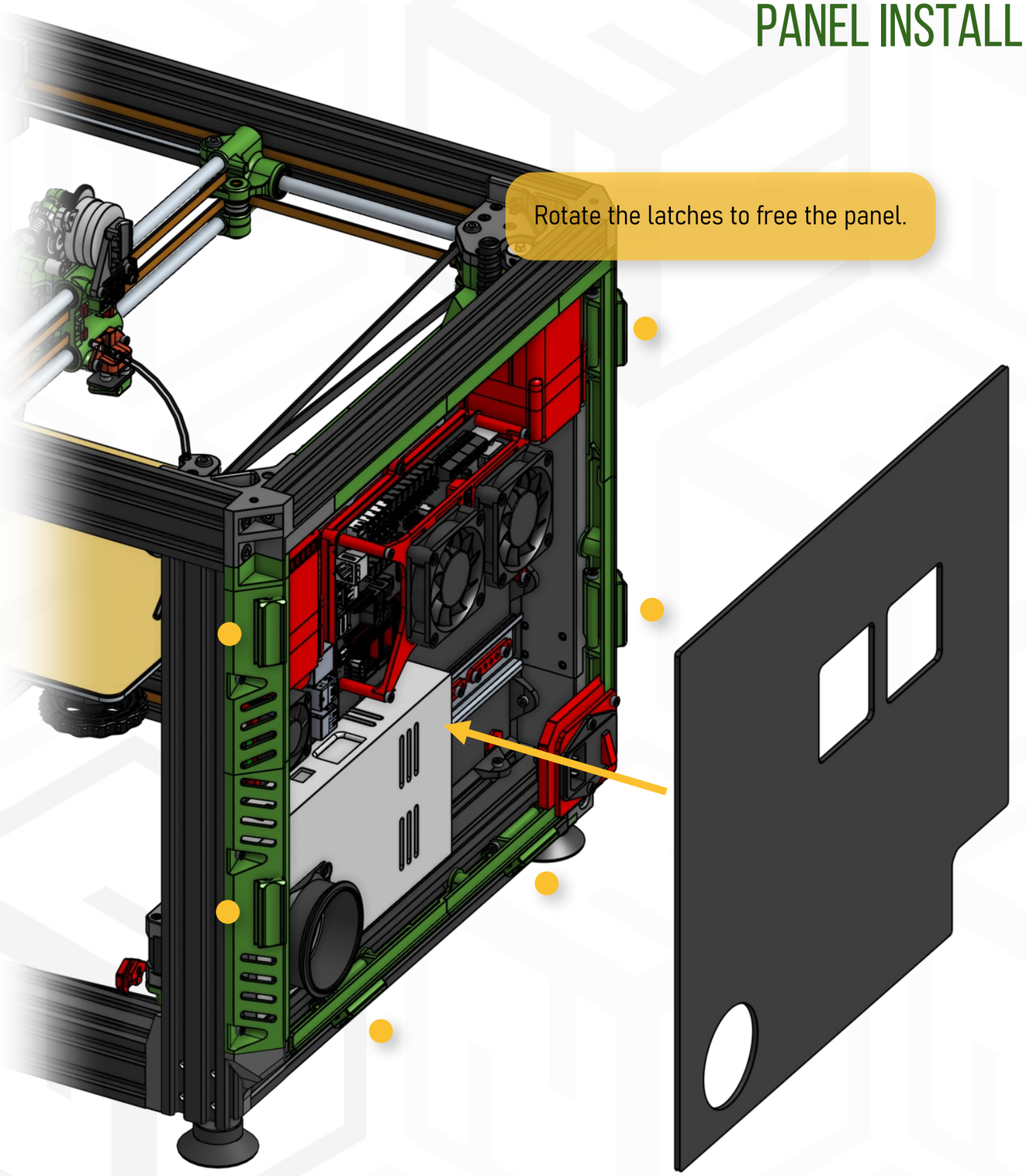
electronics_DIN_rail_generic_mount.stl
electronics_DIN_RPi_mount.stl
electronics_DIN_RPi_cooling.stl

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



ELECTRONICS
PANEL INSTALL

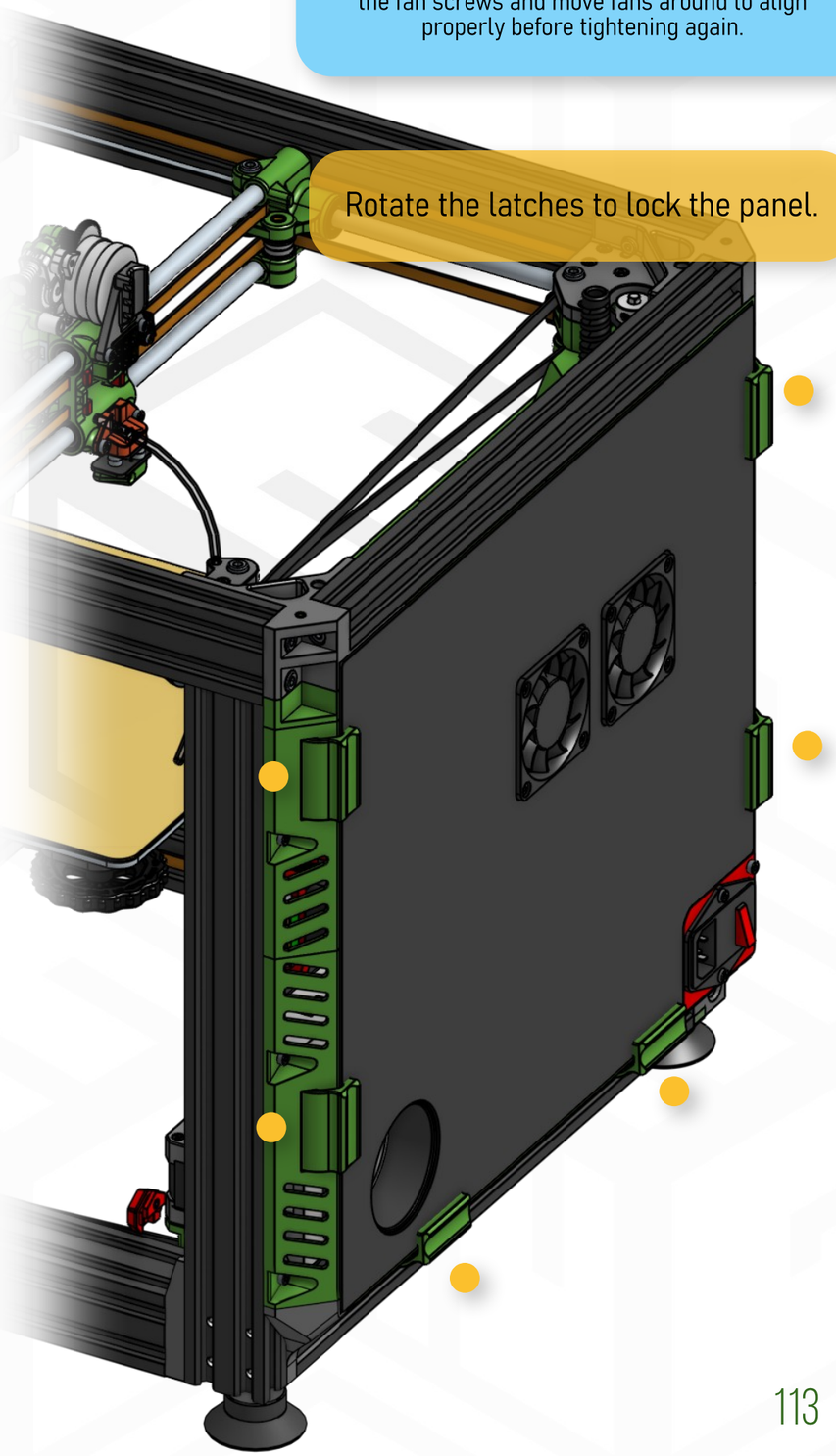
Rotate the latches to free the panel.



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.

Rotate the latches to lock the panel.



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

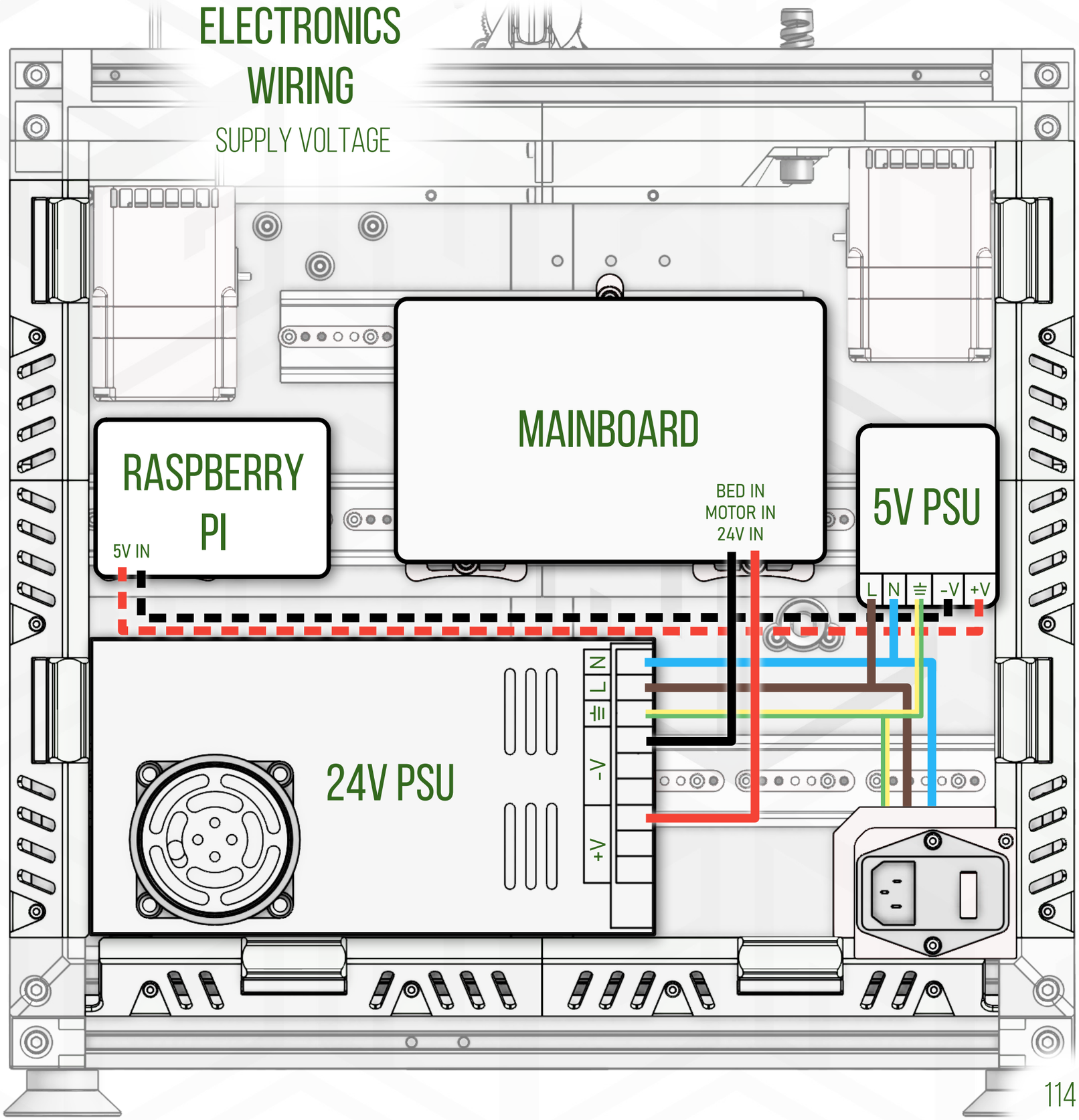
Always use adequate connectors crimped with a proper tool. Don't solder connectors that are designed to be crimped. When wiring into screw terminal connectors, never use tinned wire ends but trim and strip the wire end and use either naked conductor or preferably a crimped ferrule connector.

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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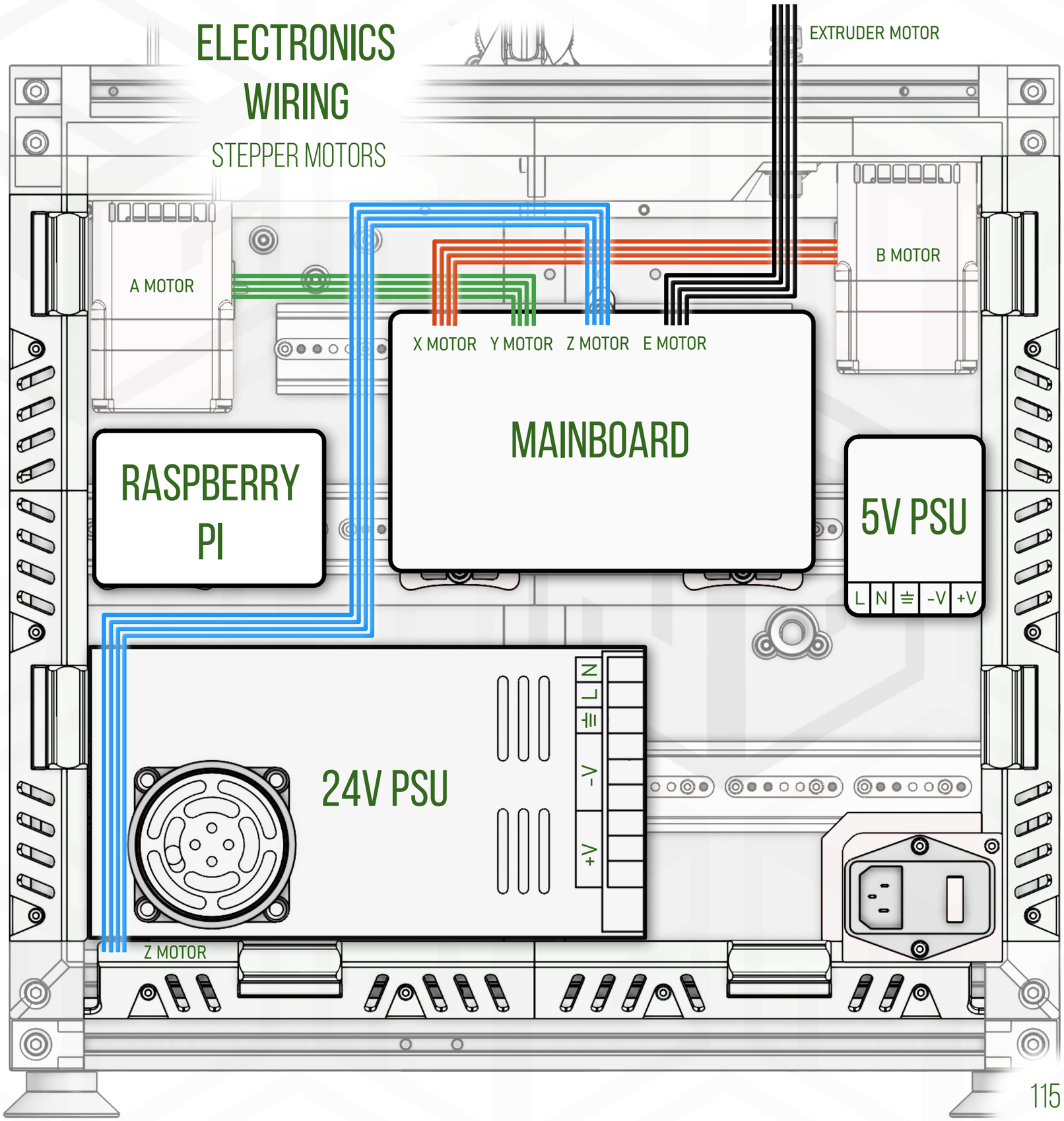
TIP: WIRE CONNECTORS

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



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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. 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

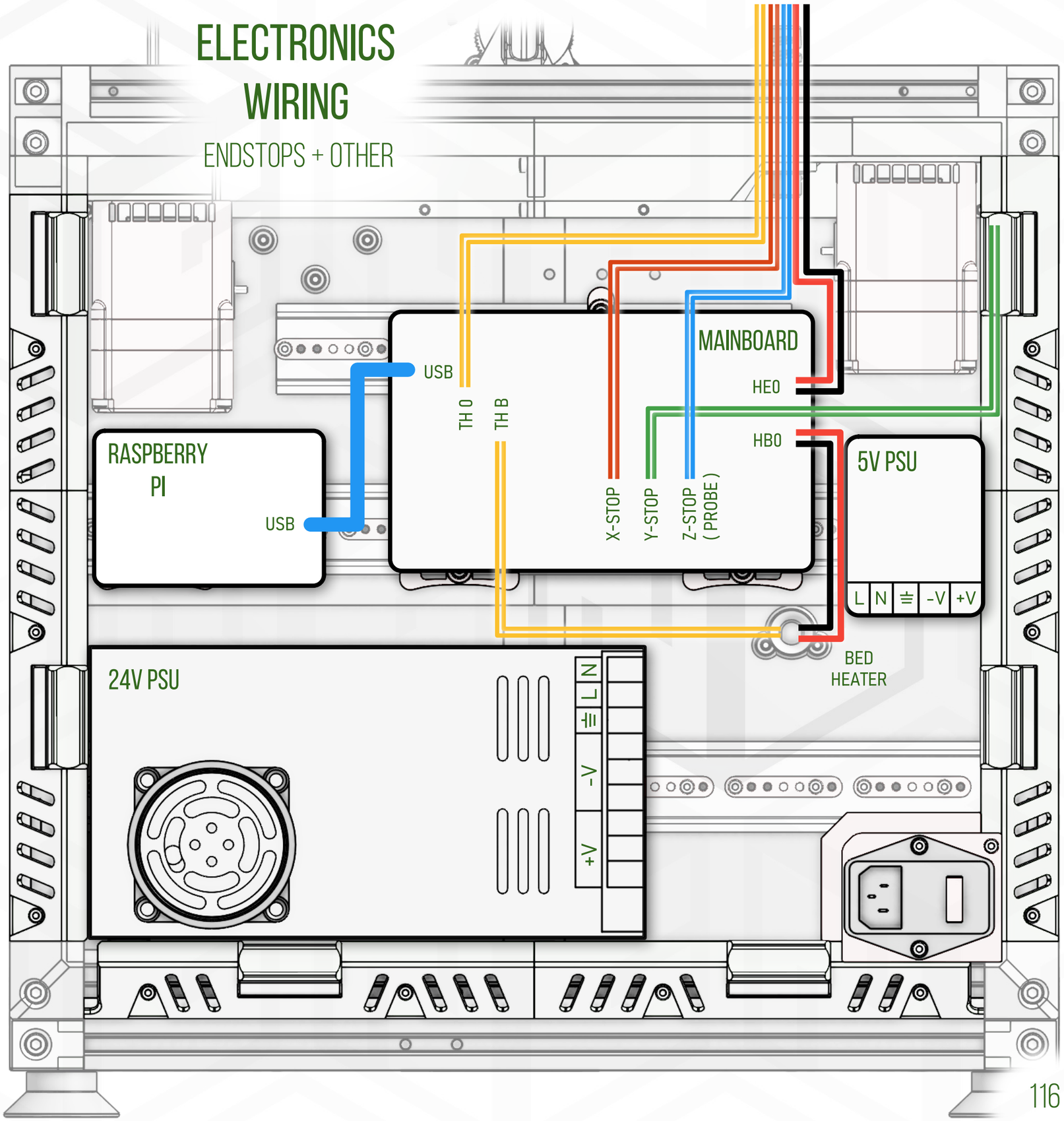
- USB CONNECTION
- HE0 - 24V HOT END HEATER (polarity not important)
- HB0 - 24V BED HEATER (polarity not important)
- TH 0 – HOT END THERMISTOR
- TH B – BED THERMISTOR
- X-STOP – X MIN ENDSTOP
- Y-STOP – Y MAX ENDSTOP
- Z-STOP – BED PROBE

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



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.

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

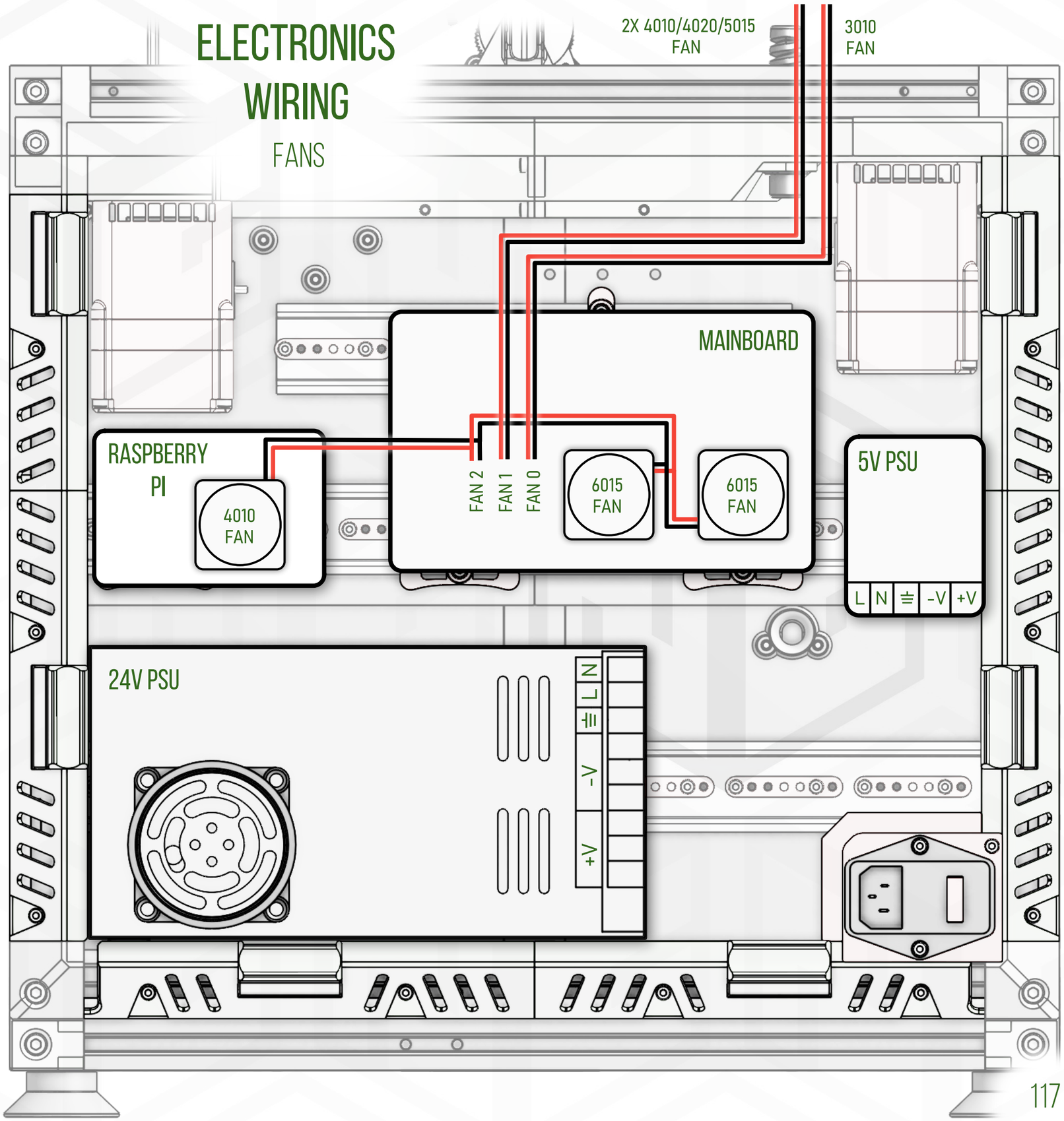
To wire in the controller, stepper motor cooling and part cooling fans, you will need to use Y splitter for the JST XH connectors or join the wires together in parallel.

WIRING SCHEME LEGEND

24V FAN WIRE

FAN

FAN 0 - Hotend cooling fan (CNC FAN if possible)
FAN 1 - Part cooling fan (CNC FAN)
FAN 2 - Controller fan (CNC FAN if possible)



FINAL STEPS

CONGRATULATIONS!

You have just finished the base build of the E3NG v1.2S! *(or at least scrolling through the build manual :)*
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 main website,
where you will also find the firmware config files.

FIRMWARE

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.

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!