

R1/R2 Bean Stirrer

(Aillio Compatible)

Open Hardware Release Manual

Designed by Dustin Betterly

Includes Build Notes, License, and Exploded Technical Drawing

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Build Notes

These notes cover recommended materials, printing considerations, and general guidance for assembling and using the Aillio Bean Stirrer. This is **not a step-by-step assembly guide**. Use the exploded view drawing for part orientation and placement.

3D Printed Parts & Materials

(Your original table with brands, links, and materials should remain exactly as-is below this text.)

The materials were selected to balance durability, printability, and performance in a high-heat environment.

- **Polymaker Fiberon PA6-CF** was chosen for the stirrer paddle and wear plates because of its **high heat deflection temperature**, ensuring that **hot roasted beans won't soften or deform the stirrer**.
- **Bambu Labs PLA-CF** was used for structural parts such as the motor housing and covers due to its stiffness, clean surface finish, and dimensional stability.

These combinations provide excellent strength and durability while maintaining reliability around elevated temperatures.

Motor Body	Bambu Labs PLA-CF
Bean Stirrer	Polymaker Fiberon PA6-CF
Axel Hub	Bambu Labs PLA-CF
Top Wear Plate	Polymaker Fiberon PA6-CF
Bottom Wear Plate	Polymaker Fiberon PA6-CF
M5 Thumb Screw	Bambu Labs PLA-CF
Motor Body Cover	Bambu Labs PLA-CF
Motor Body Wire Cover	Bambu Labs PLA-CF

Part Preparation

Stir Paddle

After printing the paddle, I applied three coats of art resin, then sanded and polished the surface. This step is optional, but it improves smoothness and overall durability.

Be careful not to let resin enter:

- the bottom screw hole
- the square axle hole

Both must remain clean for proper assembly.

M5 Thumb Screws

After printing the thumb screw bodies:

1. Thread the M5 screw into the printed body as far as it will go.
2. Secure it using either superglue or a small amount of art resin in the cavity.

Resin creates a permanent bond once cured.

Cutting the Square Rod (Stainless Bar, Item 17)

The stainless steel square rod (Item 17 in the exploded view) must be cut to a final working length of **80 mm** before assembly.

Recommended cutting steps:

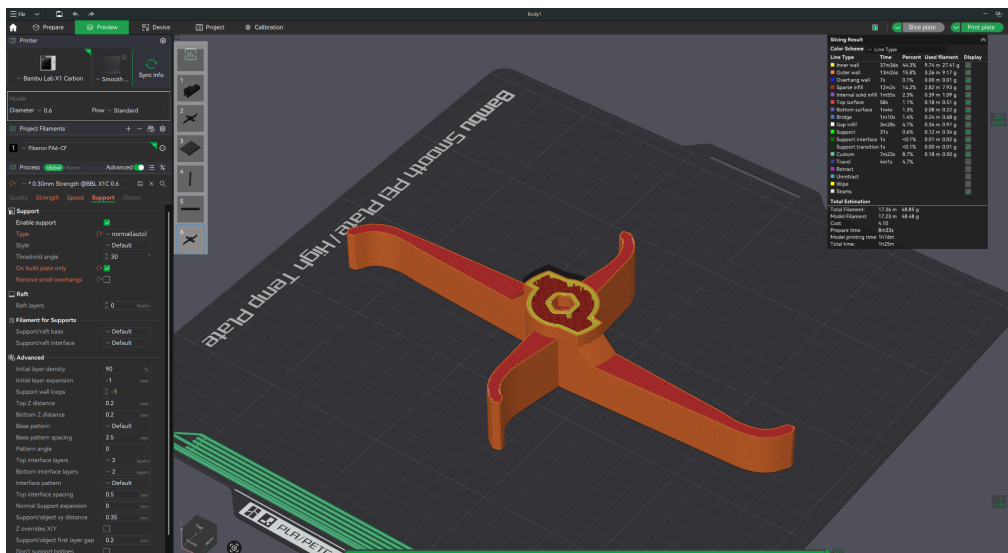
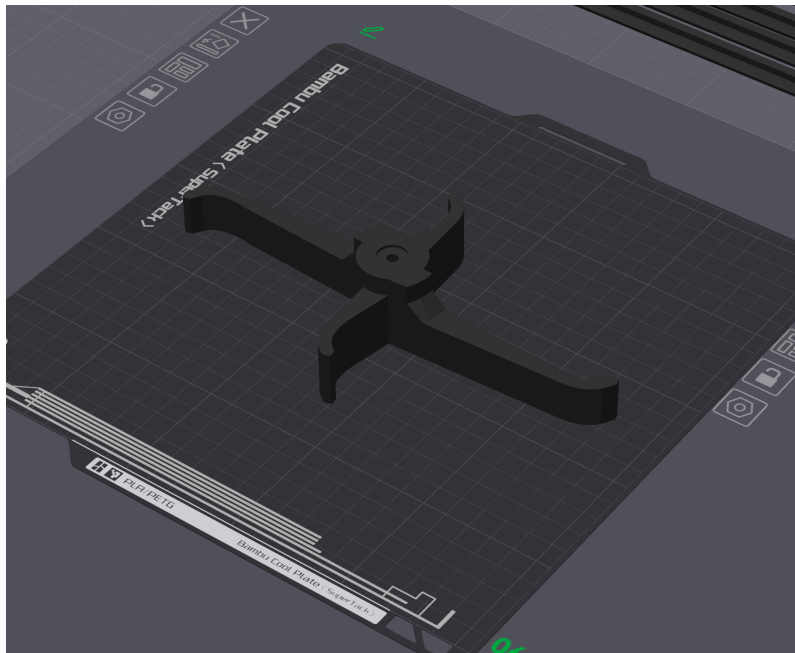
1. **Measure and mark** 80 mm from one end using calipers or a precision ruler.
2. Use a **fine-tooth hacksaw**, rotary tool with cutoff wheel, or metal bandsaw to make the cut.
3. **Deburr both ends** with a file or sandpaper (120–220 grit) to remove sharp edges.
4. Ensure the rod slides cleanly into the printed hub and coupler without binding.
5. Confirm final length is **80 ± 0.25 mm** (slight variance is acceptable)

Printing the Stir Paddle (Embedded Nut)

The paddle includes an embedded locking nut. For best results:

- Print **upside down**
- Use **supports on build plate only**
- Set a pause at the nut layer
- Insert the nut during the pause and resume the print so the upper layers encapsulate it

See the included screenshots for proper layer height and orientation.



Assembly Guidance

Use the exploded view drawing to identify part placement and orientation.

When mounting the motor:

- Leave the motor screws slightly loose during initial alignment—this helps reduce vibration.
- Once aligned, apply a small amount of blue Loctite to prevent the screws from backing out during use.

The goal is “secure but not stressed.”

Installing the Stir Paddle in the Aillio Basket

The stirrer assembly includes several components. Carefully reference the exploded view to confirm the correct stack and alignment.

There is a small hole at the very center of the basket—this is where the stir bar must align. Do **not** overtighten the screw: the stir bar should rotate freely but without wobble.

A close-up diagram is included to assist with visual orientation.

Wiring & Power Supply

The motor referenced in the BOM/exploded view is a **reverse-rotation motor**.

If the paddle spins in the wrong direction:

- Reverse the positive and negative wires at the barrel connector.
This is safe and supported by the motor’s specifications.

[A standard 12V / 2A power supply works well.](#)

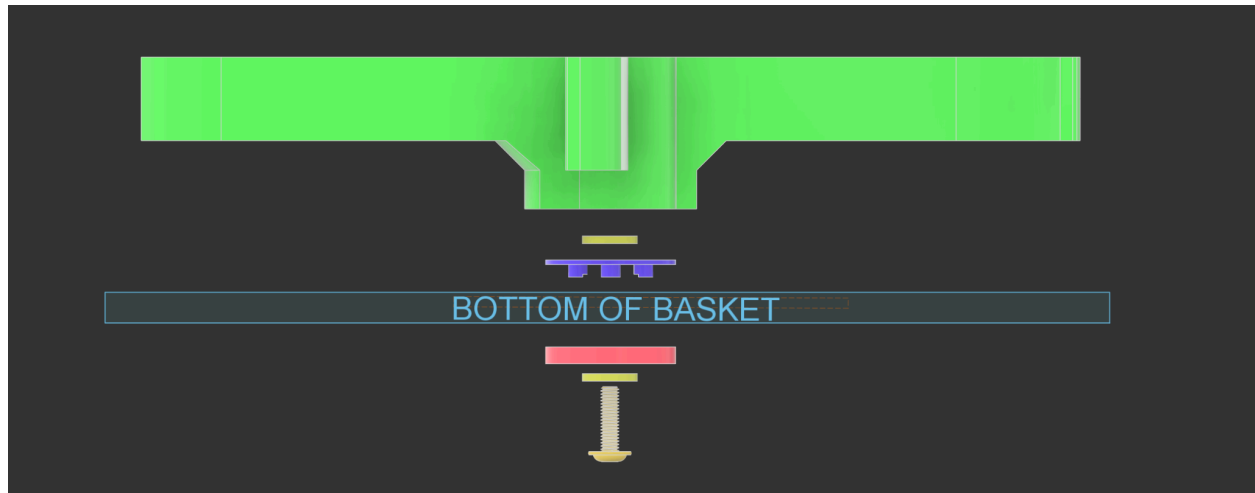
Ensure the barrel connector matches both the motor and your chosen receptacle.

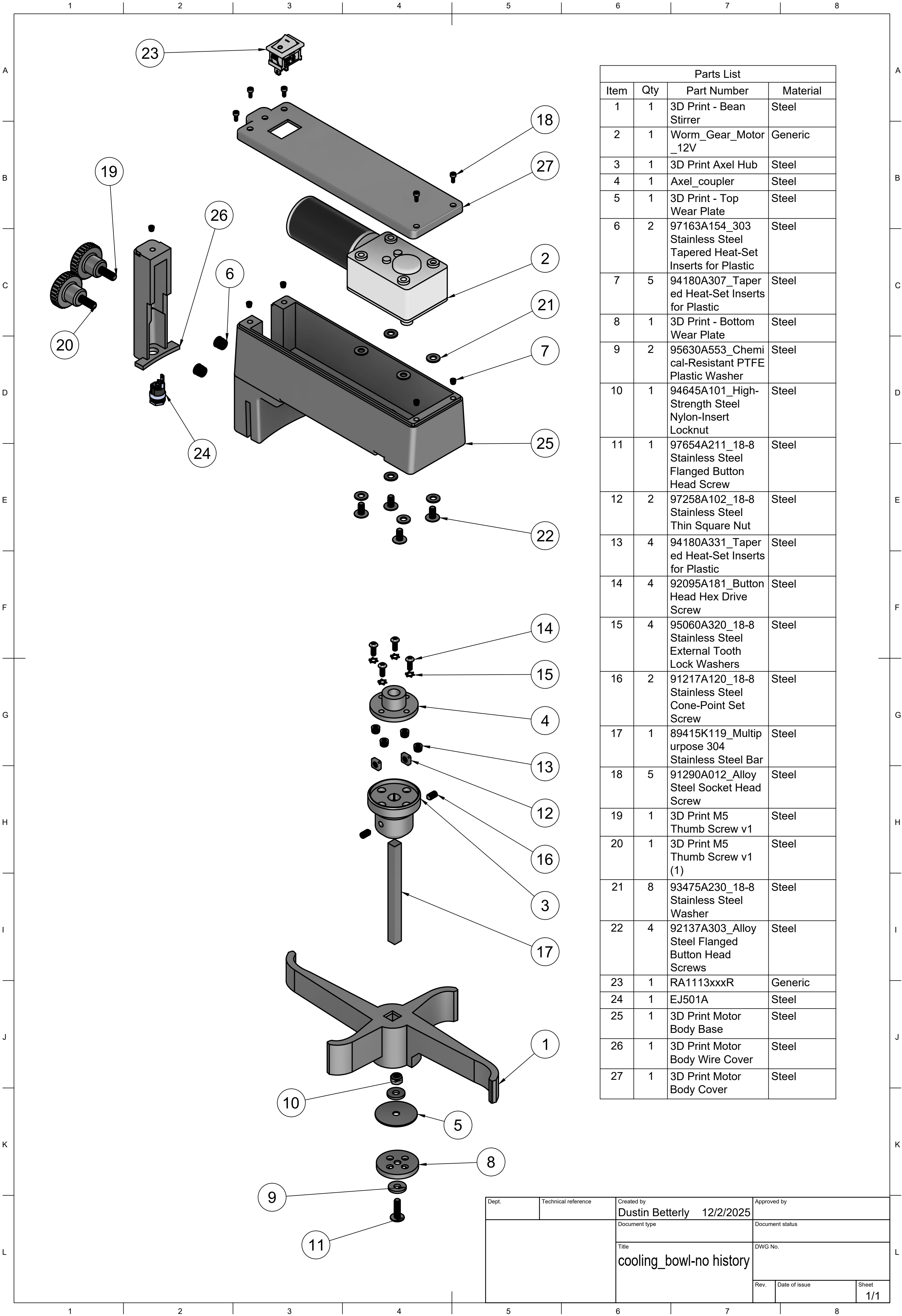
Parts Wear & Long-Term Use

This design has been tested for several weeks, but long-term wear may vary depending on materials, roasting temperature, and usage frequency.

The **white PTFE washers** are designed to be the sacrificial wear components.

With the recommended materials, overall longevity should be good, though individual results may vary.





Parts List			
Item	Qty	Part Number	Material
1	1	3D Print - Bean Stirrer	Steel
2	1	Worm_Gear_Motor_12V	Generic
3	1	3D Print Axel Hub	Steel
4	1	Axel_coupler	Steel
5	1	3D Print - Top Wear Plate	Steel
6	2	97163A154_303 Stainless Steel Tapered Heat-Set Inserts for Plastic	Steel
7	5	94180A307_Tapered Heat-Set Inserts for Plastic	Steel
8	1	3D Print - Bottom Wear Plate	Steel
9	2	95630A553_Chemical-Resistant PTFE Plastic Washer	Steel
10	1	94645A101_High-Strength Steel Nylon-Insert Locknut	Steel
11	1	97654A211_18-8 Stainless Steel Flanged Button Head Screw	Steel
12	2	97258A102_18-8 Stainless Steel Thin Square Nut	Steel
13	4	94180A331_Tapered Heat-Set Inserts for Plastic	Steel
14	4	92095A181_Button Head Hex Drive Screw	Steel
15	4	95060A320_18-8 Stainless Steel External Tooth Lock Washers	Steel
16	2	91217A120_18-8 Stainless Steel Cone-Point Set Screw	Steel
17	1	89415K119_Multipurpose 304 Stainless Steel Bar	Steel
18	5	91290A012_Alloy Steel Socket Head Screw	Steel
19	1	3D Print M5 Thumb Screw v1	Steel
20	1	3D Print M5 Thumb Screw v1 (1)	Steel
21	8	93475A230_18-8 Stainless Steel Washer	Steel
22	4	92137A303_Alloy Steel Flanged Button Head Screws	Steel
23	1	RA1113xxxR	Generic
24	1	EJ501A	Steel
25	1	3D Print Motor Body Base	Steel
26	1	3D Print Motor Body Wire Cover	Steel
27	1	3D Print Motor Body Cover	Steel

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		Rev.	Date of issue	Sheet 1/1

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BOM

12/03/2025

<u>Qty</u>	<u>Part Number</u>	<u>Part Name</u>	<u>Vendor</u>	<u>External Link</u>
1	3D Print - Bean Stirrer	3D Print - Bean Stirrer	3D Print	https://github.com/djbetterly/cooling-bean-stirrer-aillio-compatible
1	3D Print - Bottom Wear Plate	3D Print - Bottom Wear Plate	3D Print	https://github.com/djbetterly/cooling-bean-stirrer-aillio-compatible
1	3D Print - Top Wear Plate	3D Print - Top Wear Plate	3D Print	https://github.com/djbetterly/cooling-bean-stirrer-aillio-compatible
2	3D Print M5 Thumb Screw	3D Print M5 Thumb Screw	3D Print	https://github.com/djbetterly/cooling-bean-stirrer-aillio-compatible
1	3D Print Motor Body Base	3D Print Motor Body Base	3D Print	https://github.com/djbetterly/cooling-bean-stirrer-aillio-compatible
1	3D Print Motor Body Cover	3D Print Motor Body Cover	3D Print	https://github.com/djbetterly/cooling-bean-stirrer-aillio-compatible
1	3D Print Motor Body Wire Cover	3D Print Motor Body Wire Cover	3D Print	https://github.com/djbetterly/cooling-bean-stirrer-aillio-compatible
1	3D Print Axel Hub	3D Print Axel Hub	3D Print	https://github.com/djbetterly/cooling-bean-stirrer-aillio-compatible
1	Worm_Gear_Motor_12V	Worm_Gear_Motor_12V_27RPM	Amazon	https://www.amazon.com/dp/B07F8Q73VC?ref_=ppx_hzsearch_
1	Toggle Switch 13mmx19mm	Toggle Switch 13mmx19mm	Amazon	https://www.amazon.com/TWTADE-Rocker-Switch-Position-KCD1
1	DC Power Supply Jack	DC Power Supply Jack Socket Female Panel Mount Connector 3-Pin 5.5 x 2.1mm	Amazon	https://www.amazon.com/HiLetgo-Supply-Socket-Female-Connec
1	axel_coupler	axel_coupler	Amazon	https://www.amazon.com/dp/B0CSVZQHZY?ref_=ppx_hzsearch_
1	Power Supply	12v 2amp Power Supply	Amazon	https://www.amazon.com/dp/B0D269PYK9?ref_=ppx_hzsearch_
1	97654A211	18-8 Stainless Steel Flanged Button Head Screw	McMaster	https://www.mcmaster.com/97654A211/
1	94645A101	High-Strength Steel Nylon-Insert Locknut (1)	McMaster	https://www.mcmaster.com/94645A101/
2	97163A154	303 Stainless Steel Tapered Heat-Set Inserts for Plastic	McMaster	https://www.mcmaster.com/97163A154/
5	94180A307	Tapered Heat-Set Inserts for Plastic	McMaster	https://www.mcmaster.com/94180A307/
2	95630A553	Chemical-Resistant PTFE Plastic Washer	McMaster	https://www.mcmaster.com/95630A553/
4	92137A303	Alloy Steel Flanged Button Head Screws	McMaster	https://www.mcmaster.com/92137A303/
4	94180A331	Tapered Heat-Set Inserts for Plastic	McMaster	https://www.mcmaster.com/94180A331/
8	93475A230	18-8 Stainless Steel Washer	McMaster	https://www.mcmaster.com/93475A230/
5	91290A012	Alloy Steel Socket Head Screw	McMaster	https://www.mcmaster.com/91290A012/
2	91217A120	18-8 Stainless Steel Cone-Point Set Screw	McMaster	https://www.mcmaster.com/91217A120/
4	95060A320	18-8 Stainless Steel External Tooth Lock Washers	McMaster	https://www.mcmaster.com/95060A320/
4	92095A181	Button Head Hex Drive Screw	McMaster	https://www.mcmaster.com/92095A181/
2	97258A102	18-8 Stainless Steel Thin Square Nut	McMaster	https://www.mcmaster.com/97258A102/
1	89415K119	6" Multipurpose 304 Stainless Steel Bar (80mm Final Size)	McMaster	https://www.mcmaster.com/89415K11-89415K119/
2	93070A125	Alloy Steel Low-Profile Socket Head Screw	McMaster	https://www.mcmaster.com/93070A125/