

Product Introduction

1. Product Overview

Wuji Hand is a bionic dexterous hand with 20 active degrees of freedom developed by WUJI TECH, designed for various application scenarios such as scientific research, robot integration, and human-computer interaction.

2. Product Parameters

The Wuji Hand core technical parameters table provides parameter descriptions for structural design, drive control, load performance, dynamic response, and electrical characteristics, providing reference for product selection, simulation modeling, and application integration.

Parameter Category	Parameter Item	Typical Value or Description
Structure and Degrees of Freedom	Active Degrees of Freedom	20, 4 per finger
	Number of Joints	
	Finger Configuration	Full opposable, supports lateral swing
	Kinematic Configuration	Serial direct drive rotary joints, no nonlinear kinematics

	Maximum Grasping Diameter	100 mm
Dimensions and Weight	Self-weight (excluding cables)	580 ± 10 g
	Dimensions	201 mm × 75 mm × 50 mm
Drive Mode	Drive Mode	Self-locking rotary direct drive joints
	Control Algorithm	FOC vector control drive
Control and Communication	Control Frequency	1000 Hz × 20 axes
	Communication Interface	USB 2.0
	Control Mode	Position control
	Communication Protocol	Self-developed protocol
	Communication Rate	480 Mbps (theoretical value)
Load Performance	Fingertip Force	15 N
	Single Finger Maximum Load (Hook Grip)	3 kg
	Maximum Static Load for Whole-hand Grasping	10 kg
	Maximum Static Load of Whole-hand Hook Grip	10 kg

	Maximum Static Load for Whole-hand Vertical Grasping	5 kg
	Max Hanging Weight	5 kg
Dynamic Performance	Minimum Opening and Closing Time	≈ 0.3 s
	Repeat Opening and Closing Speed	≥ 2 times/s
	Thumb Flexion/Lateral Swing Speed	≥ 100 rpm
	Four-finger Bending Speed	≈ 0.25 s
Precision and Lifespan	Positioning Repeatability	± 1 mm
	Idle Grip Life	$\geq 300,000$ times
	Backlash	$\leq \pm 7$ mm
Electrical Performance	Operating Voltage	12V - 20V DC Standard 12V 20A adapter
	Static Current	1 A
	Maximum Current	35 A
	Average Current During No-load Operation	2 A

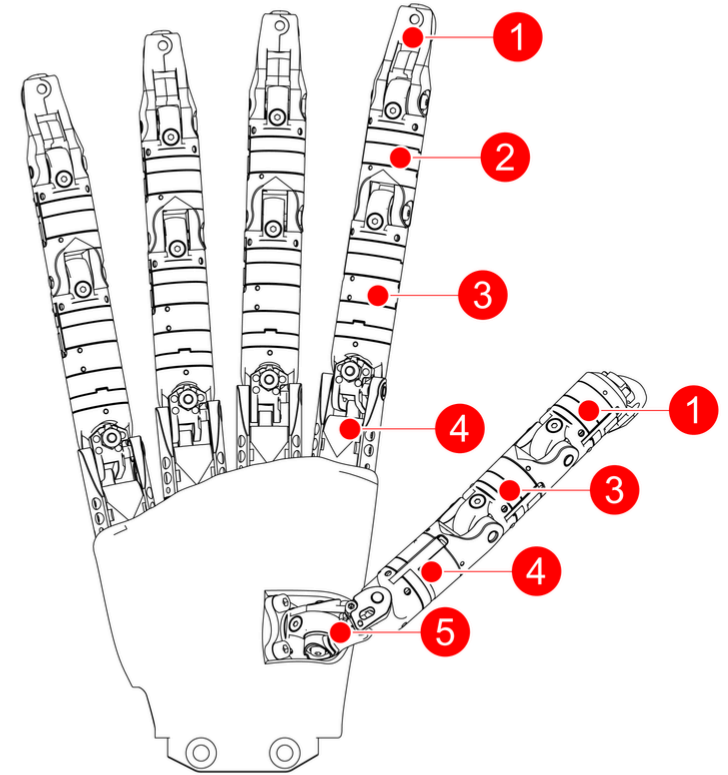
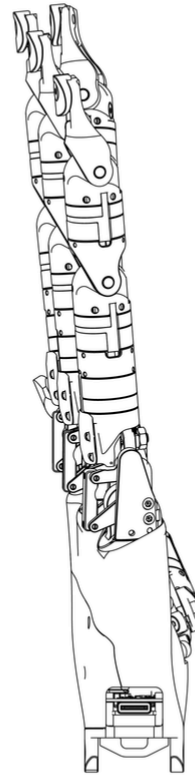
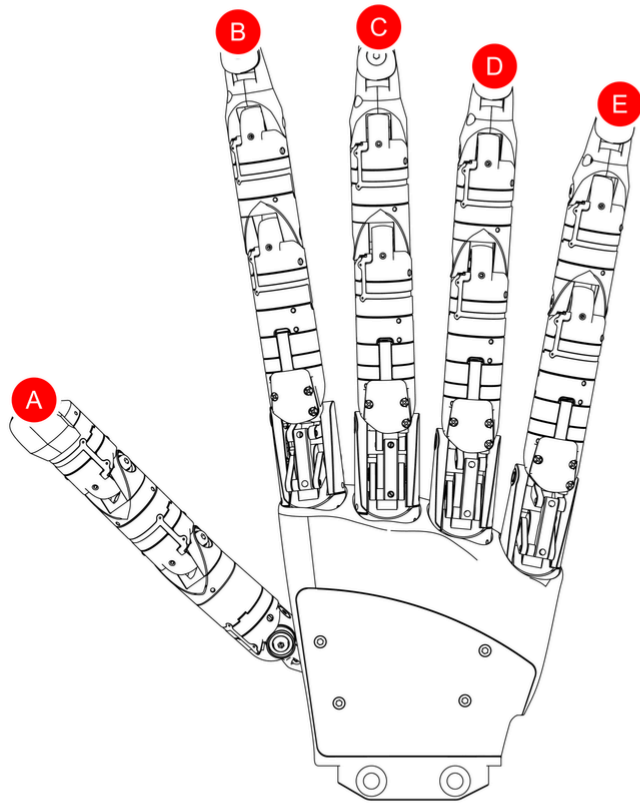
Materials and Protection	Shell Material	Aluminum alloy
	Protection Class	IP40

3. Product Structural Features

This section introduces the overall structural design of Wuji Hand, communication and power interface layout, as well as the naming conventions and motion parameters of each degree of freedom, helping users understand the mechanical structure and usage specifications of the product.

3.1 Structural Schematic

Wuji Hand adopts a five-finger bionic structural design, with each finger containing multiple joints for flexible motion. The figure below shows the overall structure and main components:



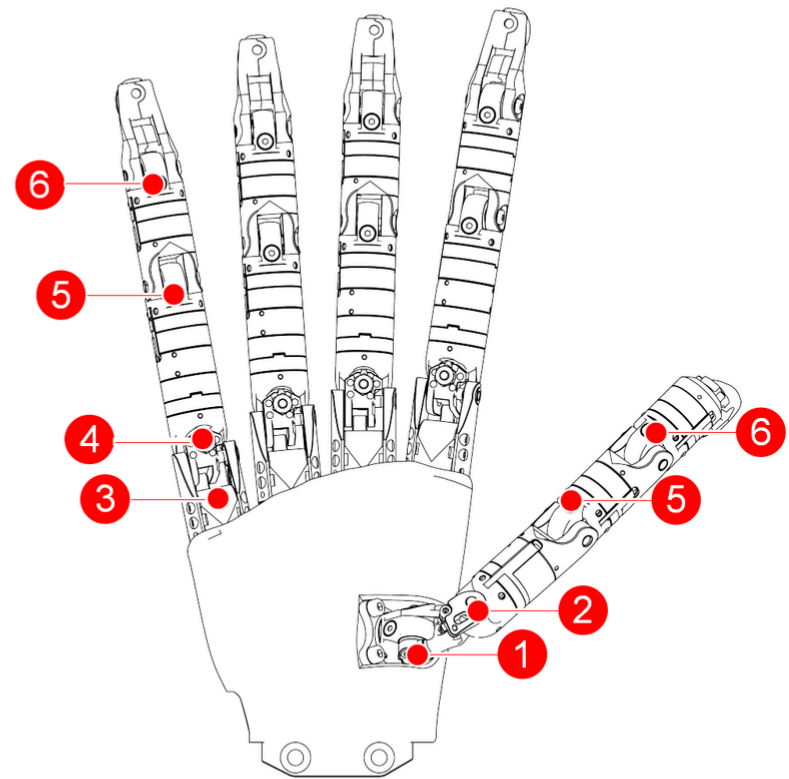
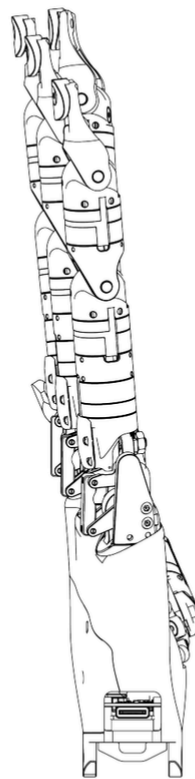
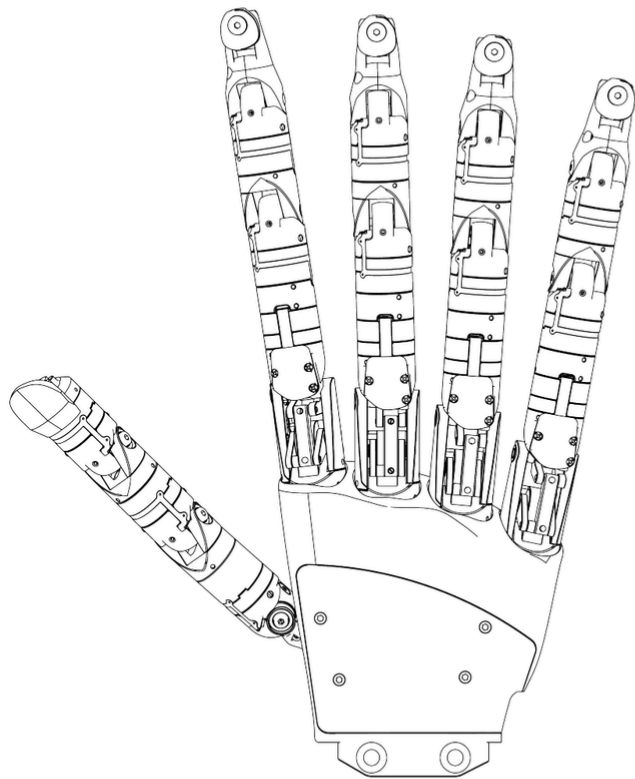
- A to E in the figure correspond to:

- A: Thumb
- B: Index

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- D: Ring
 - E: Little
 - Numbers 1 to 5 correspond to commonly used anatomical region identifications:
 - 1: Distal phalanges
 - 2: Intermediate phalanges
 - 3: Proximal phalanges
 - 4: Metacarpals
 - 5: Carpals

3.2 Wuji Hand DOF Configuration

The figure below shows the anatomical naming and corresponding positional relationships of each joint of Wuji Hand, helping users understand the functional positioning of each degree of freedom.



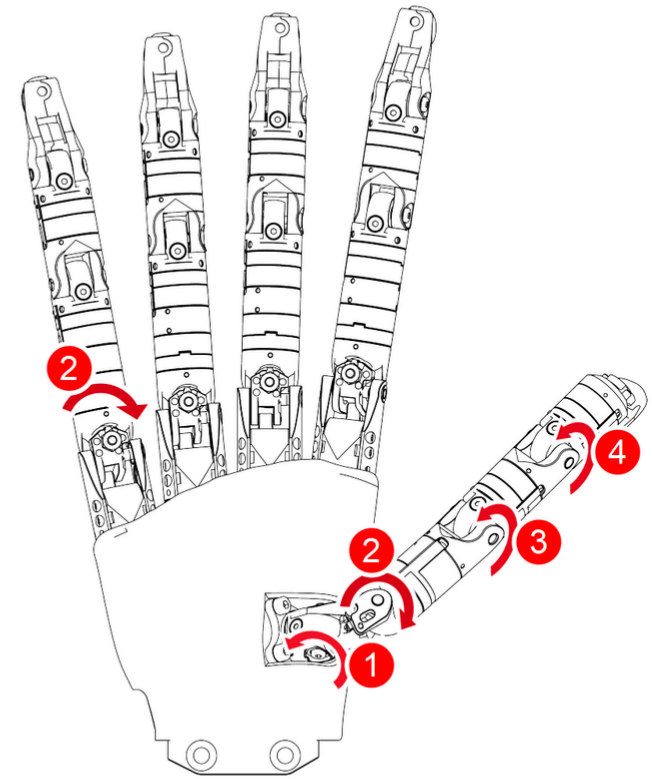
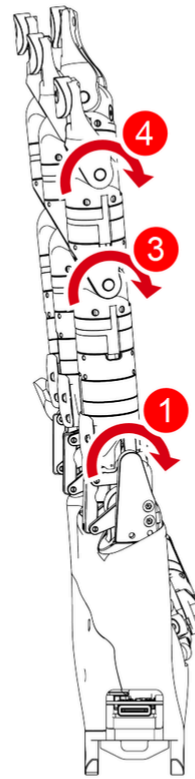
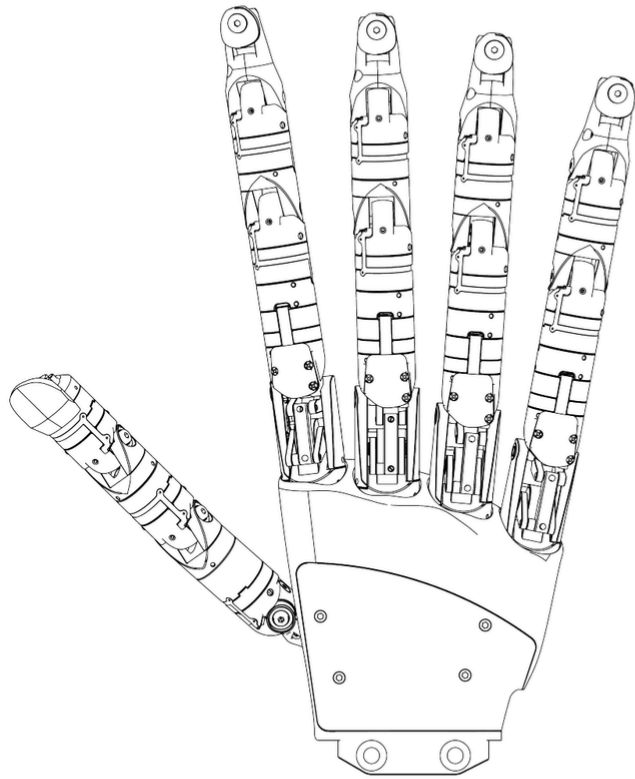
Numbers 1 to 6 in the figure correspond to:

- 1: CMC1
- 2: CMC2

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- 4: MCP2
 - 5: PIP
 - 6: DIP

3.3 DOF Motion Direction and Range

The four-finger structure is consistent, with a single finger full length of approximately 157 mm; the thumb module structure is slightly different, with a single finger full length of approximately 130 mm. The figure below uses the thumb and little finger as examples to further illustrate the motion direction and angle range of each degree of freedom:

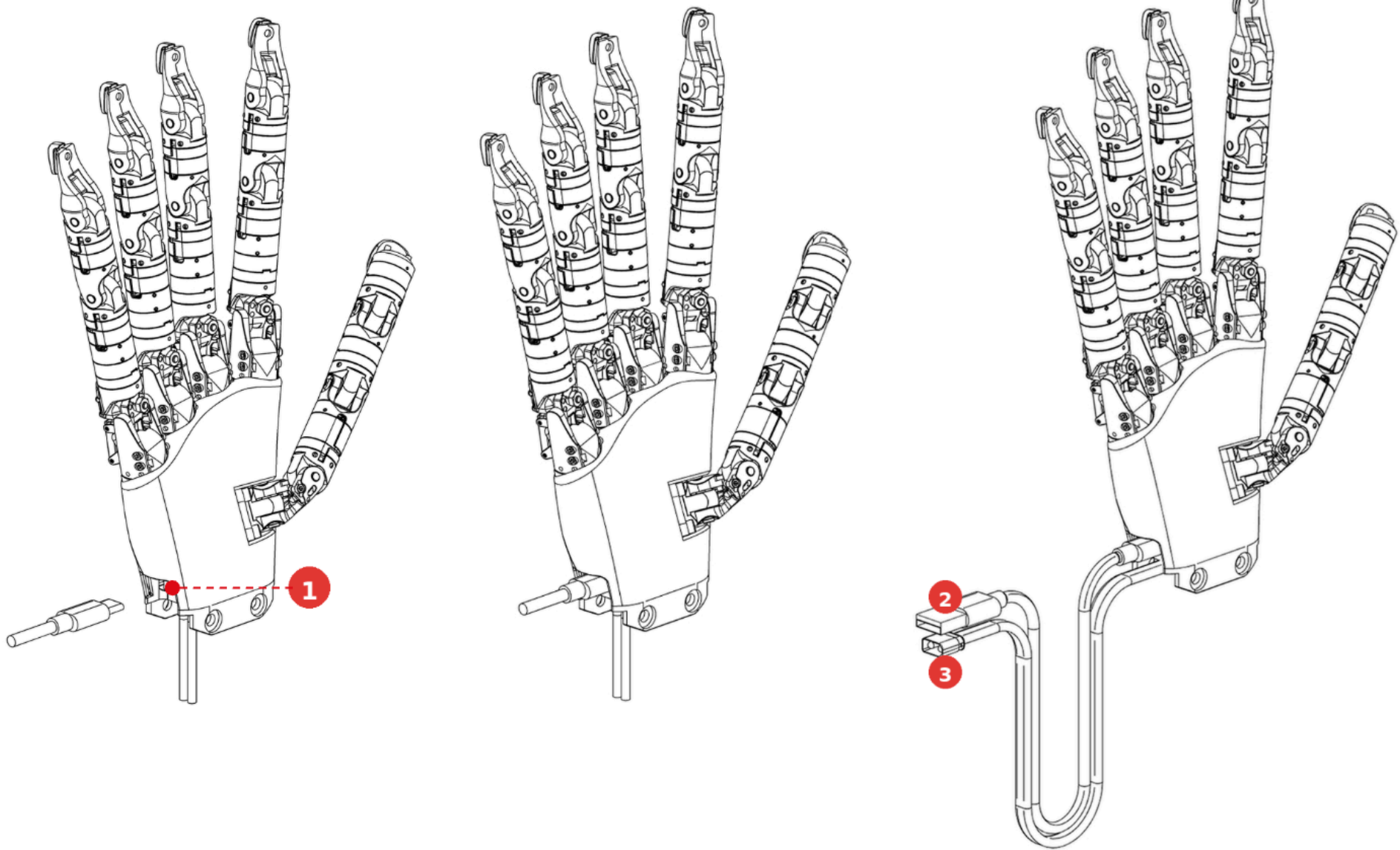


- Thumb
 - 1: Carpometacarpal abduction/adduction, motion range approximately 100°
 - 2: Carpometacarpal lateral swing, motion range approximately 80°

-
- 4: Flexion/extension, motion range approximately 130°
 - Little Finger
 - 1: Flexion/extension, motion range approximately 125°
 - 2: Lateral swing, motion range approximately 60°
 - 3: Flexion/extension, motion range approximately 130°
 - 4: Flexion/extension, motion range approximately 130°

3.4 Communication and Power Interface Schematic

Wuji Hand achieves data communication with the host computer through a USB Type-C interface while supporting external power supply. The figure below shows the communication and power interface positions and connection methods of Wuji Hand:



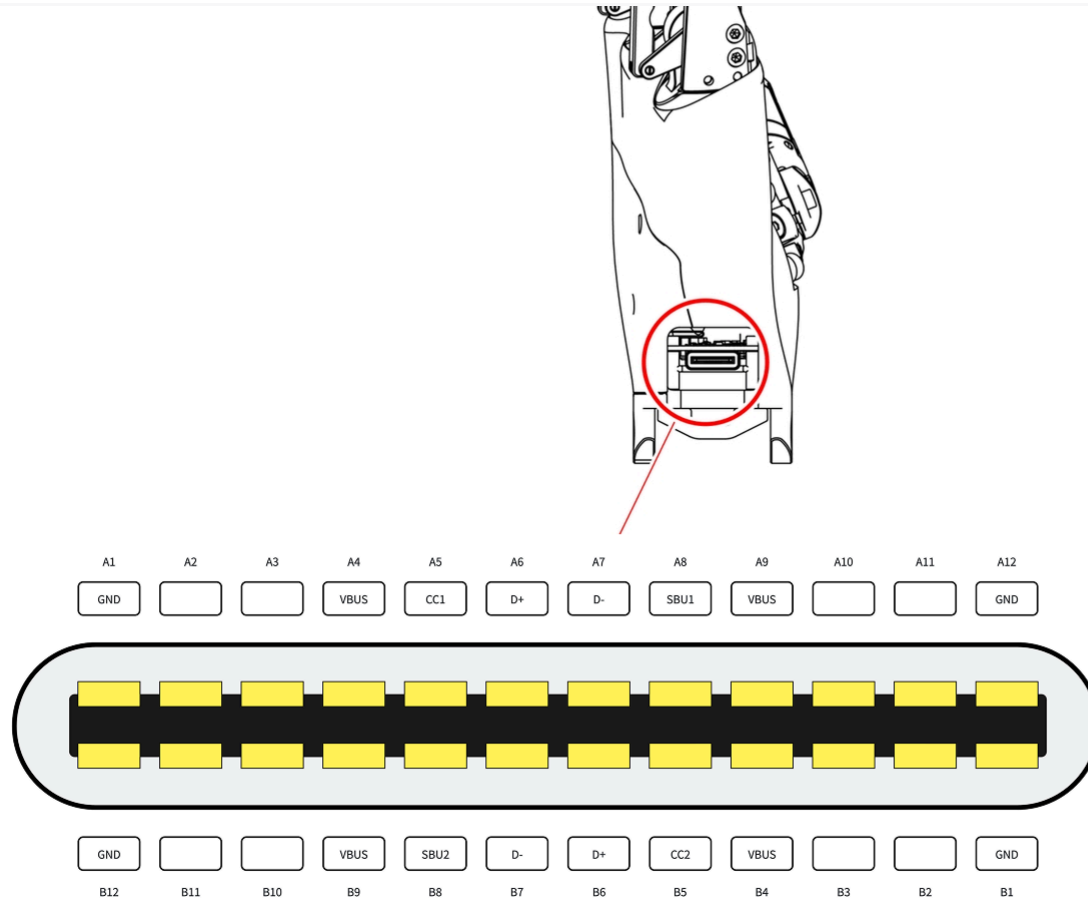
- Numbers 1 to 3 in the figure are:

- 2: USB data cable other end (connected to host computer or robot controller)
- 3: XT30 power interface for external power supply

 Note: Use original matching cables to ensure communication stability and power supply safety

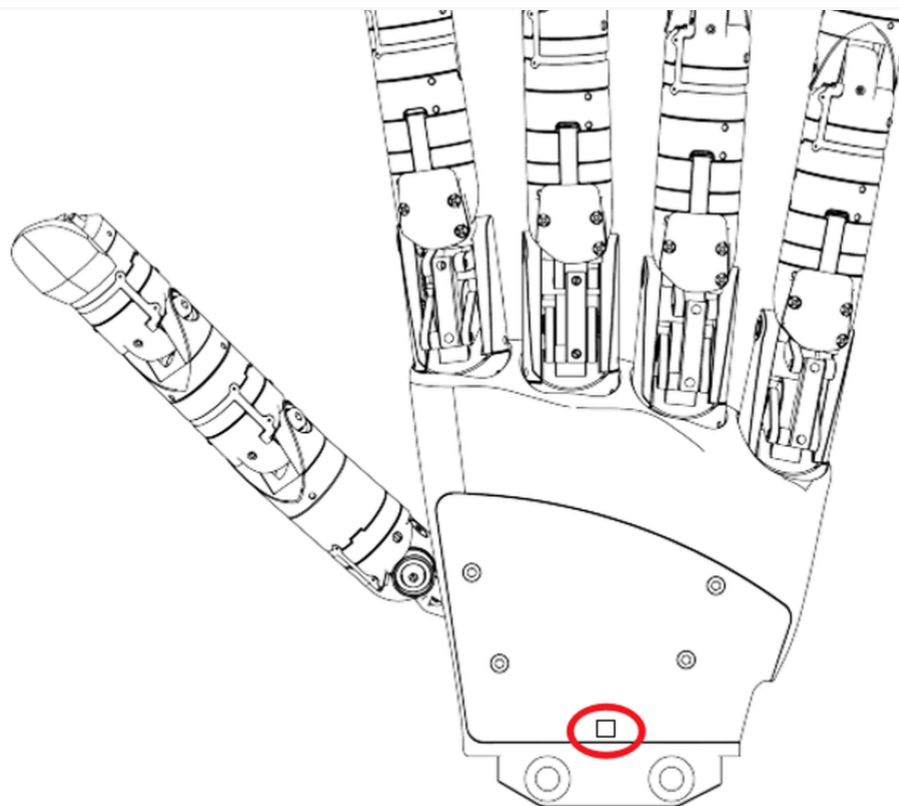
4. Product Electrical Characteristics

4.1 Pin Definition



4.2 Indicator Light Reference Table

An RGB status indicator sits on the lower back of the hand. It provides real-time feedback on power supply and system operation.



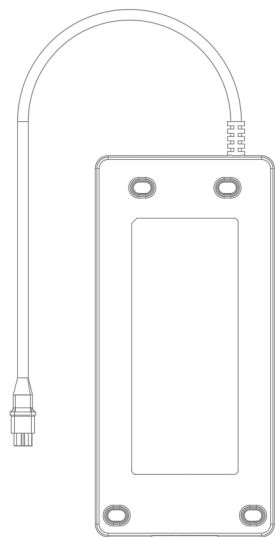
The meanings corresponding to each status are shown in the table below:

				Description	
		No Light	OFF	Powered off/unpowered state	Power supply not connected or main power failure
		Blue Solid	BLDR_RUNNING	Firmware update or bootloader	Device is in bootloader. If device is performing firmware upgrade, strictly prohibit power disconnection or cable reconnection to avoid system damage
		Green Flashing	APP_PENDING	Normal standby	Power supply normal, system normal, not connected to host computer or SDK
		Green Solid	APP_RUNNING	Normal operation	Power supply normal, system started, connected to host computer or SDK
		Yellow Solid	APP_WARN	Device warning	System detected warnings such as high temperature, power fluctuation, and other non-fatal faults. Pause debugging and investigate the warning cause

			Description	
		Red Flashing	APP_PREFATAL	Fault warning
	—	Red Solid	APP_FATAL	Critical fault
				Warning of impending fault, such as temperature approaching overtemperature threshold
				Serious hardware/software fault (such as main MCU abnormality, communication out of sync, etc.). Disable immediately and troubleshoot via host computer (observe indicator light, terminal log, reset/factory restore)

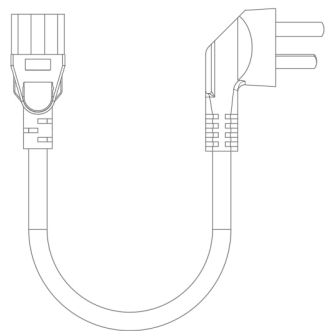
5. Product Accessories Introduction

5.1 Product Accessories Table

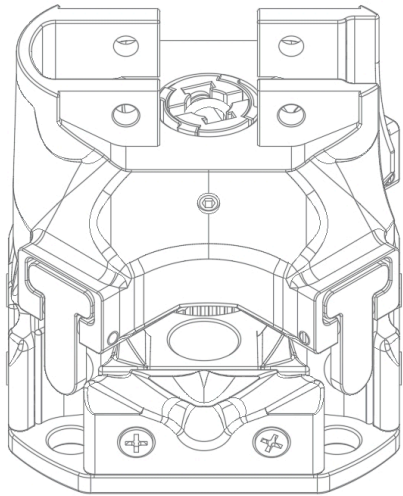


12V 20A Power Adapter

Power supply

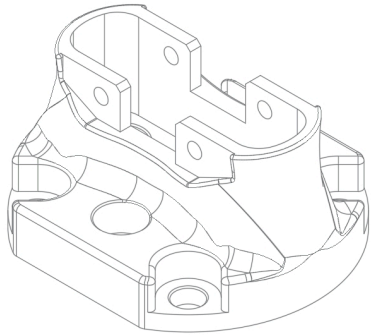


Power Adapter AC Cable



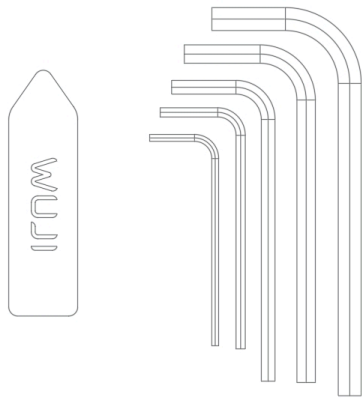
Impact-resistant Adapter

See 5.2 Impact-resistant
Adapter



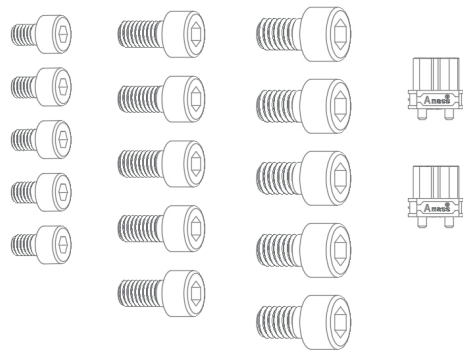
Direct-mount Adapter

Connects Wuji Hand to user equipment (such as robot arm flange)



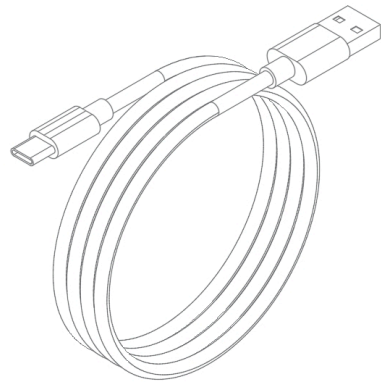
Toolkit

- Hex wrench
- Pry bar: for separating the latched impact-resistant adapter



Accessory Kit

- Socket head cap screws:
M4x6, M5x10, M6x10
- XT30 female connector



USB A to USB C Cable

For communication between
host device and Wuji Hand

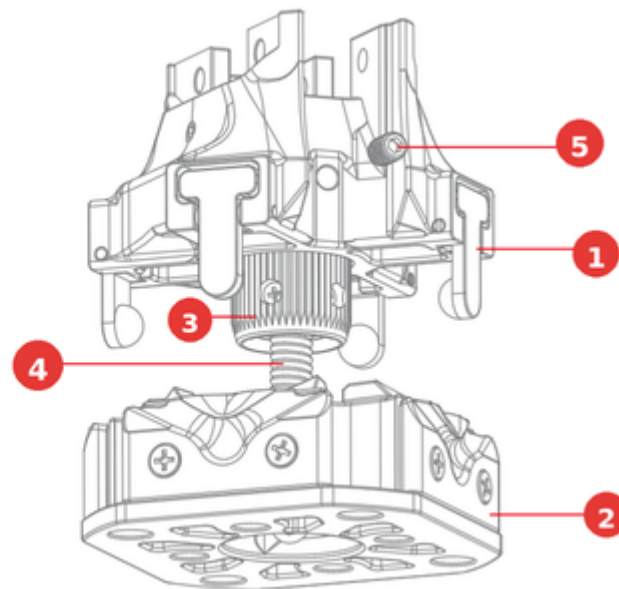
5.2 Impact-resistant Adapter

The impact-resistant adapter uses a twist-lock and slot locking structure to maintain a rigid connection under normal conditions. When subjected to external impact forces exceeding the safety threshold (such as robot arm loss of control or severe end-effector collision), Wuji Hand and the robot arm will trigger active separation to protect critical components (joints, motors, reducers, etc.) from damage. This design ensures improved reliability while minimizing maintenance and repair risks.

or minor impacts.

- **Abnormal state:** Automatically releases when exceeding the safety threshold, with Wuji Hand suspended by the safety chain to avoid secondary impact or falling hazards.

i This trigger mechanism has been engineered to ensure it will not be falsely triggered during normal minor vibrations or routine operations, and is only effective for severe impacts exceeding the safety threshold. Note that this mechanism mainly covers most common impact and vulnerable scenarios, but cannot completely avoid potential damage in all extreme situations.



1	Four-claw Latch
2	Grooved Flange
3	Twist-lock
4	Safety Chain
5	Set Screw

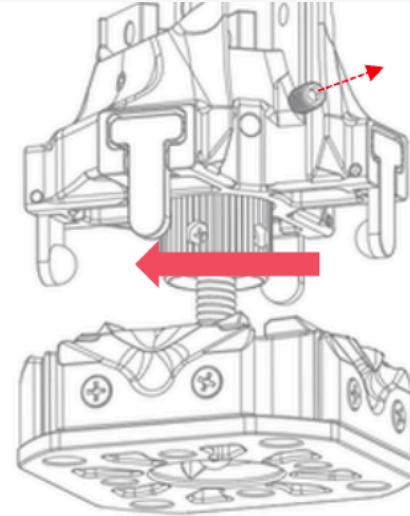
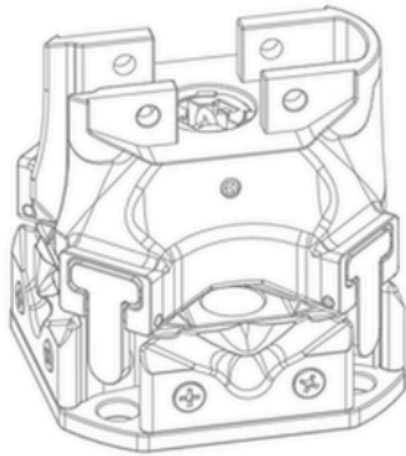
6. Installation and Removal

Safety Warning:

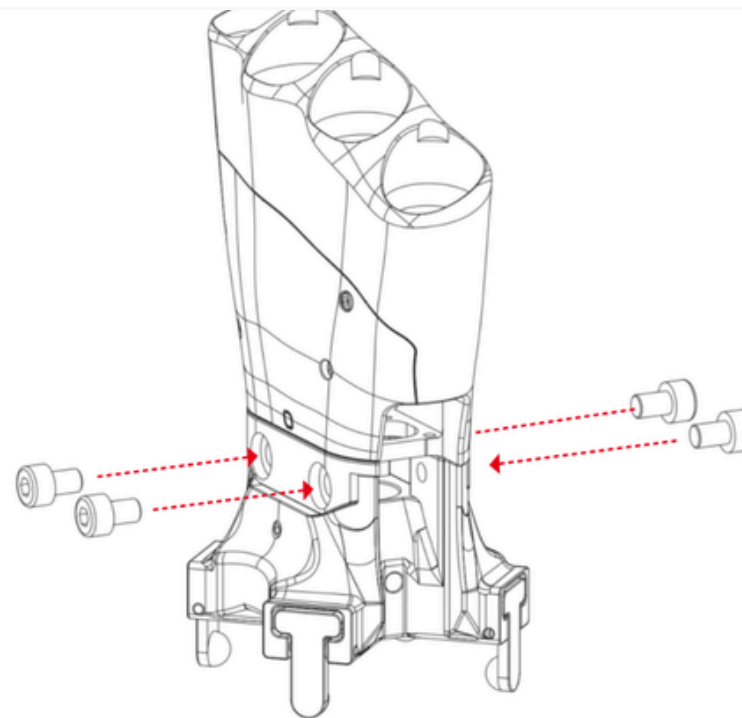
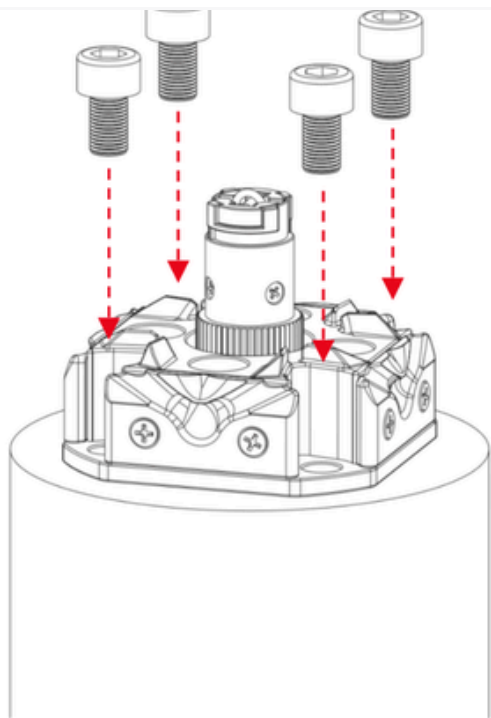
- Installation and removal must be performed with power off; live operation is prohibited
- After installation, confirm that the twist-lock is fully tightened and the set screw is locked before starting the robot arm

6.1 Installation Steps

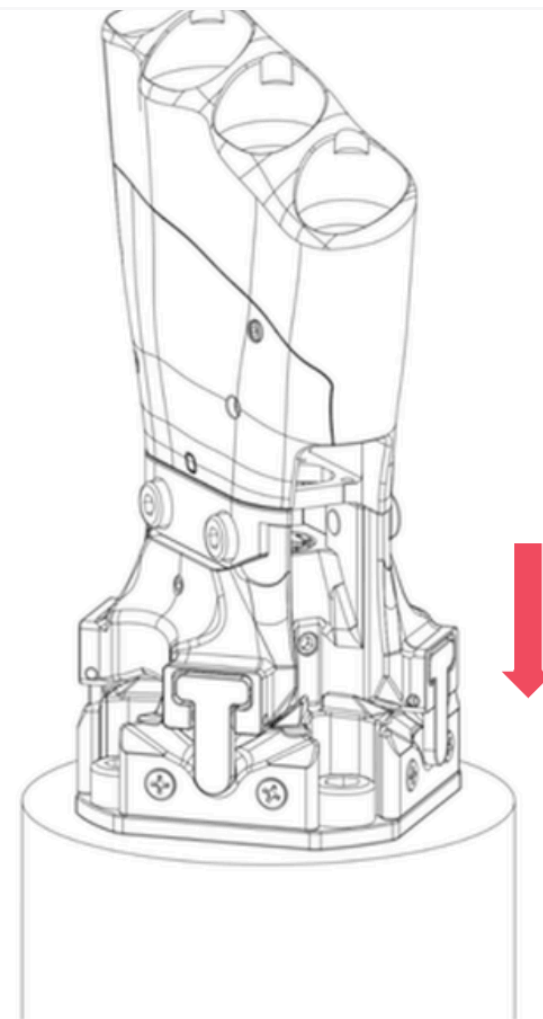
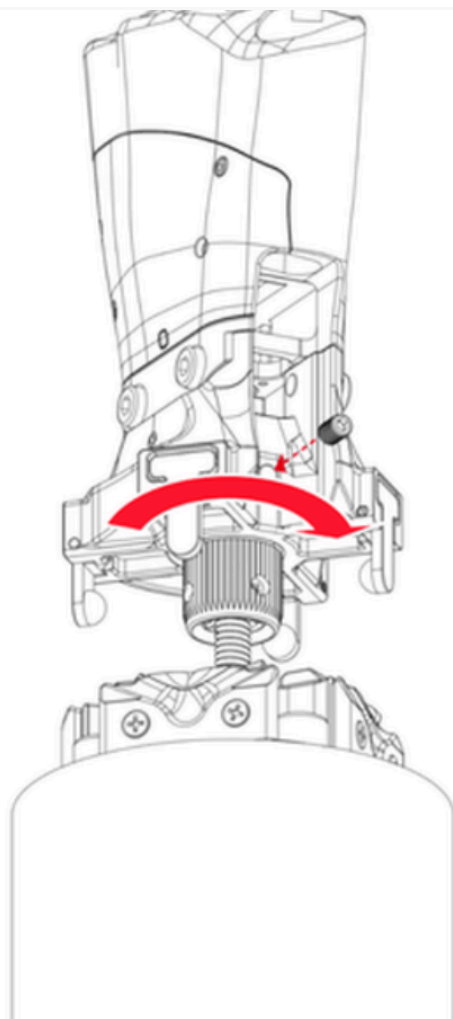
Step 1: Remove the impact-resistant adapter from the packaging (left image), pull apart the four-claw latch and grooved flange (right image), remove the set screw and rotate the twist-lock counterclockwise to separate the upper and lower components.



Step 2: Use screws to connect the grooved flange to the user equipment (such as robot arm). The grooved flange provides two hole sizes, with matching screw sizes of M5×10 and M6×10. Use M4×6 screws to connect Wuji Hand to the four-claw latch.



Step 3: Insert the twist-lock into the four-claw latch and rotate clockwise until tight (gently pull the safety chain to verify the twist-lock will not slip out). Install the set screw. Align the four-claw latch with the positioning slot on the grooved flange, press down to latch, and the impact-resistant adapter installation is complete.



6.2 Precautions

Fastening Check

- Use recommended specification screws; screws of insufficient length or incorrect specifications are strictly prohibited

- If possible, configure a recommended torque wrench according to screw specifications to ensure tightening torque meets standards

Maintenance and Inspection

- After each installation or removal, check whether the **safety chain and twist-lock** are flexible, unworn, and whether the attachment points are loose
- If impact-resistant release is triggered during operation, check whether installation screws are loose and whether the twist-lock locking mechanism is intact before reinstallation