灵心巧手
-LINKERBOT-

Linker Hand L30
Product Manual

Linkerbot Beijing Technology Co.,Ltd

Version revision record

Version number	Date change	Change Notes
V1.0	2025.08.2	First Edition
v1.1	2025.08.20	Updated content
V 1.2	2025.09.11	Updated content
V1.3	2025.10.27	Modify the appearance image

Safety Instructions

Before installing or using this product, please read this manual and related manuals carefully. Please be sure to read the relevant instructions for the safety matters described in the manuals.

1. It is necessary to ensure that this product is connected using the supporting or specified cables, and the product is properly fixed in accordance with regulations. Do not use damaged power cords, plugs, or loose sockets.
2. This product must comply with the installation requirements described in this manual. Using this product under conditions that exceed the specified installation requirements may shorten the product's service life and may cause serious safety issues.
3. This equipment can only be used by trained personnel. Do not open the housing or disassemble the equipment without authorization. If the equipment malfunctions, do not repair it by yourself; please contact our after-sales service department.
4. The diagrams and photos in this manual are representative examples and may have slight differences in details from the purchased product. In addition, this manual may be appropriately revised due to product improvements, specification changes, or other reasons.

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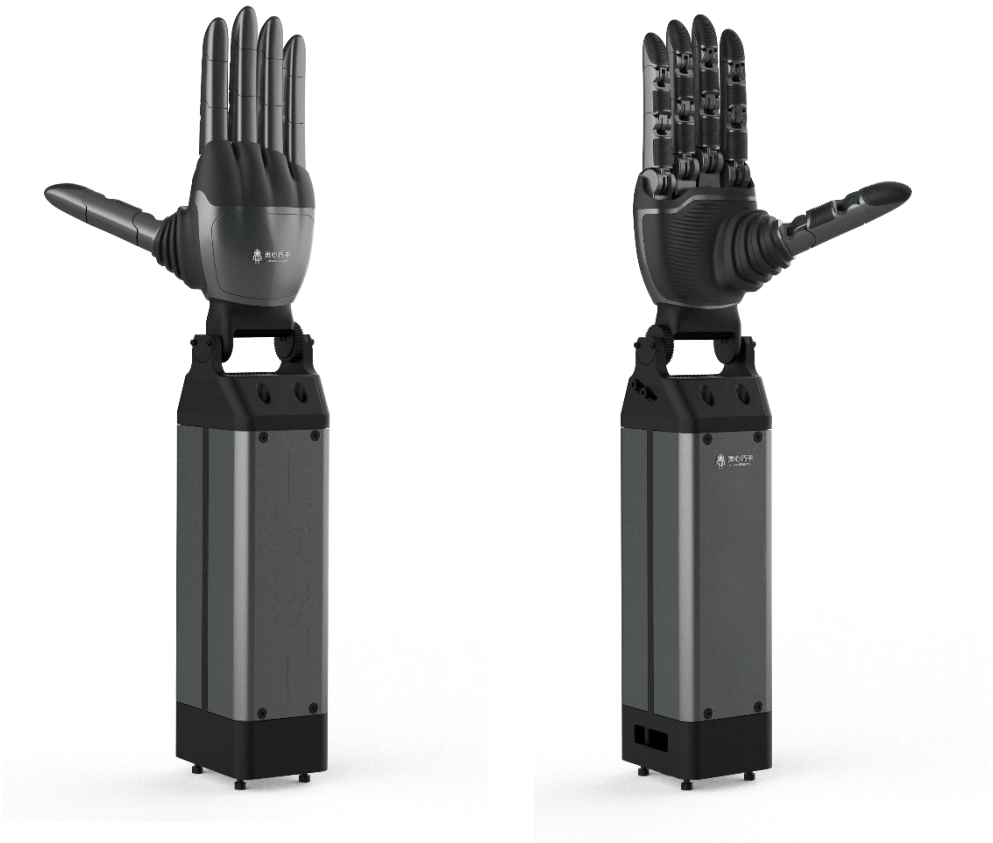
1 Product Introduction



Product diagram of Linker Hand L30 Linker Hand

The Linker Hand L30 is a new generation of modular anthropomorphic dexterous hand launched by Linxin Qiaoshou Company. As a representative product in the field of tendon-driven robotic end effectors, its technology and performance embody the latest R&D achievements in this domain, incorporating the team's core technical expertise in motion control, bionic design, and mechatronics integration.

This dexterous hand has the core objective of "replicating the fine movements of the human hand." It deeply integrates principles of bionics with advanced mechatronics technology: it not only relies on the logic of human hand movement to create a multi-degree-of-freedom (DOF) bionic structure, but also integrates high-precision control and real-time sensing capabilities to achieve an efficient unification of "flexible movement" and "precise operation".

In terms of key performance, its movement flexibility supports complex

actions like pinching, grasping, and twisting. Its operational accuracy remains stable at the millimeter level, and its system reliability has been verified under harsh working conditions. These three core indicators (movement flexibility, operational accuracy, and system reliability) are all at the industry-leading level, enabling it to provide highly adaptable robotic end-effector solutions for fields such as industrial automation, medical assistance, and scientific research experiments .

The specific features of the product are introduced as follows.

1) Bionic Drive Architecture

It adopts a tendon-driven transmission system (comprising ultra-high-molecular-weight polyethylene ropes and polytetrafluoroethylene tubes). Precise actuation is achieved through a remote motor group, enabling coordinated control of 5 fingers with 17 degrees of freedom and 21 joints (including 1 wrist degree of freedom).

The product features a compact anthropomorphic design consistent with the size of an adult human palm. While ensuring 3 degrees of freedom per finger for anthropomorphic motion capability, it significantly improves spatial utilization efficiency and can accurately replicate the core characteristics of multi-joint coordinated movement in the human hand.

2) High-Precision Force Control Capability

It integrates high-resolution encoders and a tendon tension control algorithm. Relying on an adaptive PID algorithm for real-time dynamic adjustment, it achieves a repetitive positioning accuracy of ±0.20mm. This enables it to stably perform precision tasks with stringent accuracy requirements, such as screw tightening and thin sheet picking.

3) Payload and Adaptability

It employs an opposable thumb configuration paired with a four-finger independent force control system, capable of delivering a maximum precision grip force of 10N.

The fingertips incorporate a built-in high-sensitivity tactile sensor array

with object detection functionality, allowing it to autonomously adapt to the stable grasping requirements of various irregularly shaped objects without human intervention.

4) Rapid Response Performance

It boasts excellent motion response performance. The speed of core movements like four-finger flexion and thumb abduction can exceed 400°/s, and the hand opening/closing time is only 0.2 seconds.

This characteristic enables it to efficiently adapt to high-speed operation scenarios like industrial assembly lines, significantly enhancing overall operational efficiency.

5) User-Friendly Control and Integration

It is equipped with dual Mini-USB and CAN FD communication interfaces, supporting a 500Hz communication frequency. This allows for seamless integration with industrial automation equipment and service robot platforms.

It not only facilitates quick integration with various control systems but also achieves millisecond-level real-time control response, ensuring the real-time and precise execution of commands. This fully meets the high-precision operation requirements of different scenarios and guarantees control reliability and timeliness in complex working conditions.

1.1 Product features

1.1.1 Position control

It can accurately control the spatial position of the entire hand and each finger joint, and can smoothly execute preset trajectory movements to ensure the operation accuracy from the overall action to the fine-tuning of a single joint, and meet the needs of precision assembly, pathization operations and other scenarios with high requirements for position accuracy.

1.1.2 Speed control

The finger movement speed can be flexibly adjusted according to the needs of the task, and the speed mode can be accurately adapted to different operation rhythms

- the high-speed mode improves efficiency, and the low-speed mode ensures the safety of fine operation, so as to efficiently balance operation efficiency and operational safety, and adapt to diverse task scenarios.

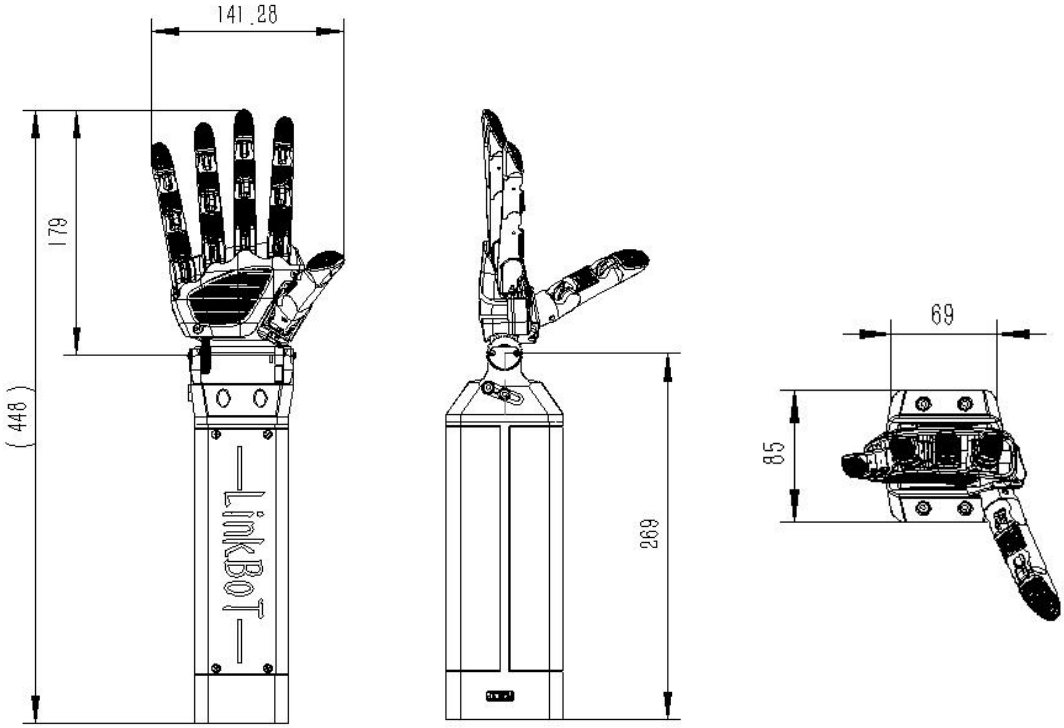
1.1.3 Haptic feedback (force control)

With the help of the fingertip sensor to sense and accurately control the force and torque applied by the finger in real time, the output force can be dynamically adjusted: it not only avoids damage to fragile objects due to excessive force, but also prevents objects from slipping due to insufficient force, providing reliable force control guarantee for fine operations such as screw locking and thin sheet grasping.

1.1.4 Online Upgrade

It supports online update of the firmware of the dexterous hand system through the upper computer, continuously iterates functional modules, optimizes core performance parameters, adapts to industrial scenarios and scientific research needs that require long-term upgrades and iterations, and ensures that the equipment is in a long-term efficient operation state.

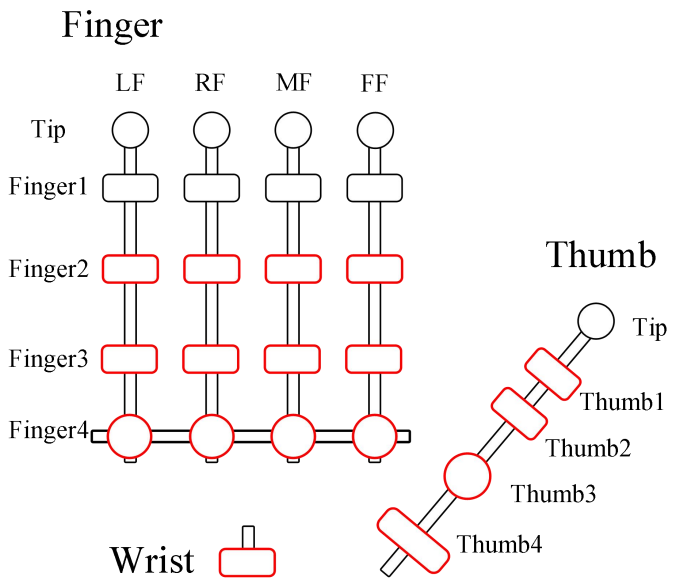
1.2 Appearance Dimensions



Dimensions (mm)

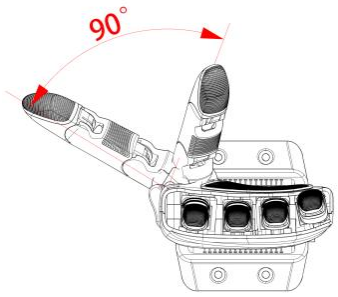
1.3 Degrees of freedom and range of motion

The Linker Hand L30 has a total of 17 degrees of freedom (DOF) and 21 joints, of which 17 are active joints and 4 are passive joints. The active joints, relying on high-precision drive units, enable sub-millimeter-level motion control and complex posture switching, supporting precision operations. The passive joints, through bionic elastic structures, adaptively adjust force feedback during movement, both cushioning impacts and reducing system energy consumption. This "active-passive" collaborative design not only ensures human hand-level flexible manipulation capability but also optimizes power efficiency and structural stability. This enables it to adapt to the fine operation requirements of multiple scenarios such as scientific research and testing, industrial sorting, and medical rehabilitation.

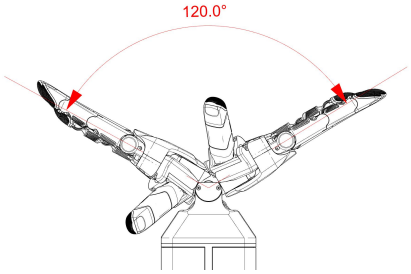


Joint degree of freedom diagram

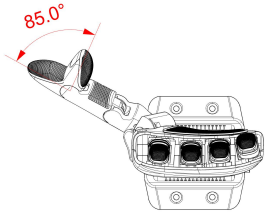
The following is the maximum range of structural activities for this product. The actual range of controlled activities is limited to prevent structural collisions, so the actual range of activities may be less than the following range of activities.



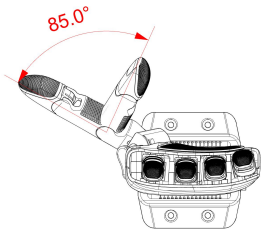
Thumb4 Joint Angle Diagram



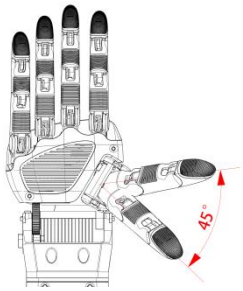
The Wrist Joint Angle Diagram



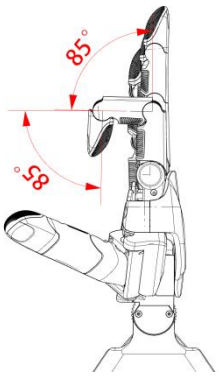
Thumb1 Joint Angle Diagram



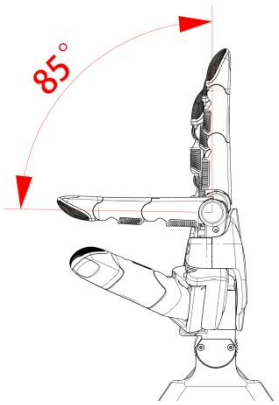
Thumb2 Joint Angle Diagram



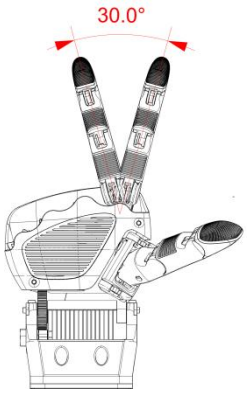
Thumb3 Joint Angle Diagram



Flexion angle of the DIP、PIP joint



Flexion angle of the MCP joint



Four-Finger Abduction Angle Schematic Diagram

The following table shows the actual controlled movement angle and movement speed of this product.

Joints	Angle of motion (°)	Movement speed (° / s)

Wrist (Bending)	44.7°	171.9°/s
THUMB1 (Bending)	85.4°	406.6°/s
THUMB2（Bending）	91.9°	437.6°/s
THUMB3（Side Swing）	75.8°	315.8°/s
THUMB4（Bending）	44.7°	406.3°/s
LF1、RF1、MF1、FF1（Bending）	82.5°	-
LF2、RF2、MF2、FF2（Bending）	90°	450°/s
LF3、RF3、MF3、FF3（Bending）	84.3°	443.6°/s
FF4（(Side Swing）	21°	190.9°/s
MF4（(Side Swing）	20.6°	187.2°/s
RF4（(Side Swing）	19.3°	241.2°/s
LF4（(Side Swing）	15.1°	302°/s

1.4 Product Parameters

1.4.1 Basic Parameters

Model	Left hand L30
Degrees of freedom	17
Number of Joints	21 (17 active + 4 passive)
Transmission Method	Tendon-Driven
Control Interface	CAN FD
Communication Rate	500kbps
Weights	≈1400g
Maximum load	5kg

Operating voltage	DC24V
Quiescent current	0.45A
No-load motion average current	0.63A
Maximum current	2.3A
Repeat Positioning Accuracy	±0.20mm
opening and closing time	0.2s

1.4.2 Force performance parameters

Performance Indicators	Specific Parameters
Maximum thumb tip force	8N
Maximum four-finger fingertip force	7N
Five fingers Maximum grip strength	12N

1.5 Sensors Systems

The Linker Hand L30 is optionally equipped with pressure-sensitive sensors, with the specific parameters as follows.

Parameters	Specification
Piezoresistive array	6*12
Sensor force area	9.6 *14.4mm
Trigger force	5g
Range (of scales or measuring equipment)	20N
Life span	100,000 times
Communications frame rate	200FPS

2 Installation and Commissioning

2.1 Accessory List

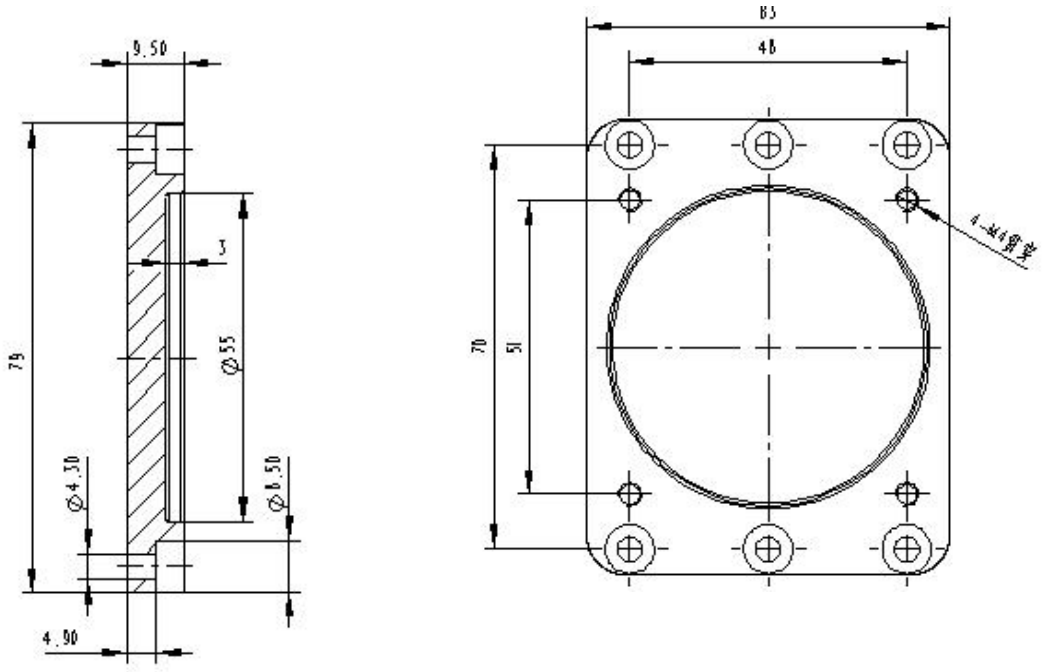
Before installing the product, check that the accessories are complete.

NO.	Name	Quantities	Picture
1	USB-to-CAN FD Debugging Cable	1	
2	USB Cable	1	
3	Connector Cable XT30 (2+2)	1	
4	Power Adapter	1	
5	Power Cable	1	

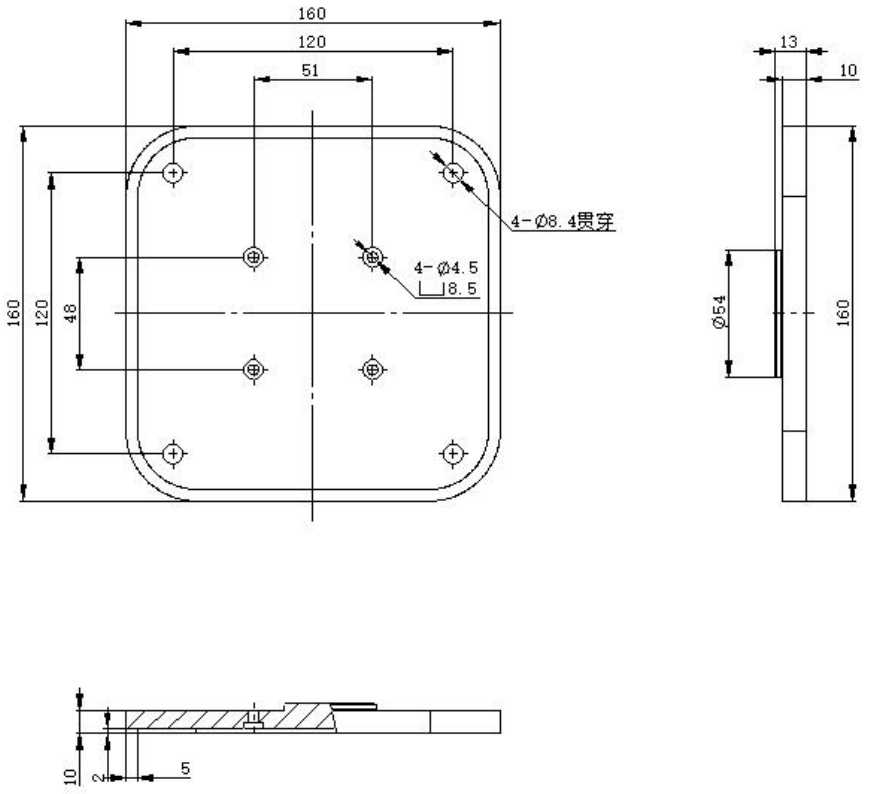
2.2 Installation Instructions

2.2.1 Structural installation instructions

M4 screws are required for mounting, the length of which is adjusted according to the thickness of the fixing parts, and the structure of the mounting flange is shown below.



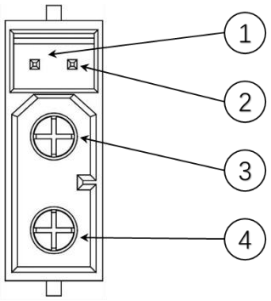
Flange Structure Diagram



Fixed Base Hole Location Diagram

2.2.2 Electrical Installation Instructions

The product uses the XT30 (2+2) connector with the following wiring sequence.



linear sequence	clarification
1	CAN L
2	CAN H
3	GND
4	24V

2.3 Debugging Preparation

2.3.1 Debugging Cable Connection

Using a USB-to-CAN FD debugging cable, connect the dexterous hand to the debugging PC via a USB cable. After connecting the power cable to the power adapter, plug it into the power port of the USB-to-CAN FD debugging cable, and connect the other end to an AC220V power strip.

2.2.1 Upper Computer Software Description

1) Unzip the compressed package and execute dexterous_hand_controller.exe；
2) Dexterous Hand Connection and Parameter Configuration

Connection Interface Diagram

Click the "Connect Device" button in the "Device Control" area; the upper computer will automatically establish a connection with the device.Upon successful connection, the product model and serial number will be displayed below. The "Global Control" section allows for setting the global speed and torque.

3) Controlling the Dexterous Hand Movement

Joint Status and Control Diagram

In the "Joint Status and Control" section, the corresponding joint can be rotated by dragging the slider or entering a specific position.

4) Action Sequence Description

Action Sequence Diagram

The "Action Sequence Editor" displays all currently read action sequences. Click the corresponding joint data to modify it.

- "Position Operation" area button functions

Read to Slider: Reads the current angular data of each joint from the device into the sliders.

Save to Sequence: Saves the current position of each joint of the dexterous hand as an action sequence.

Execute: Executes the selected action sequence.

- "Sequence Control" area button functions:

Start: Executes the action sequence list according to the parameters set in "Run Parameters" .

Stop: Stops the currently executing action sequence.

- "File Operation" area button functions:

  Save: Saves the current action sequence list to a specified file.

  Read: Reads an action sequence file into the upper computer.

- "Run Parameters" area parameters

  Interval (sec) : The time interval after executing the current action sequence before executing the next one.

  Cycles: The number of times all action sequences are executed in a loop.

  Delete: Deletes the currently selected action sequence.

  Clear: Clears all action sequences.

- Action Sequence Usage Description:

Operate each joint to move -> Click "Save to Sequence" to generate Sequence 1 -> Operate each joint to move again -> Click "Save to Sequence" to generate Sequence 2 -> Click "Start" -> The actions of Sequence 1 and Sequence 2 will be executed in a loop.

3 After-sales and service terms

1) The product is covered by a 12-month limited warranty from the date of purchase.
2) During the warranty period, we will provide free repair or component replacement for faults caused by manufacturing or material defects.
3) Exclusion Clauses: The following situations are not covered by the warranty:
   - Cosmetic wear and tear caused by normal use.
   - Damage caused by improper operation, accidents, unauthorized disassembly, or failure to follow the guidelines.
4) No return or exchange will be accepted for non-quality issues.
5) If the product malfunctions in any way, please contact the official after-sales service immediately and do not disassemble it by yourself.
6) Corresponding fees will be charged for repairs outside the warranty period.