灵心巧手
LINKERBOT

Linker Hand L20
Product Manual

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Version revision record

Version number	Date change	Change Notes
V 1.0	2025.09.05	Linker Hand L20 Product Manual First Edition

Table of Contents

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. If this product operates at high power for a long time, its temperature will rise. When the temperature is too high, please stop operation and let it stand for a period of time to cool down before using it again.
4. 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.
5. 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.

1 Product Introduction

Product diagram of Linker Hand L20

Linker Hand L20 is a 21-joint dexterous hand, which accurately simulates the natural grasping of human hands and delicate operation; It adopts innovative linkage drive and self-developed motor to ensure high precision of movement, supports force, vision, and tactile sensors, and improves environmental adaptability and intelligent interaction with multi-modal perception.

With its high degree of freedom, multi-modal perception, and advanced force-position hybrid algorithms, the Linker Hand L20 is widely used in education and scientific research, industrial automation, housework assistance, health care, and other fields, providing precise and dexterous operation solutions.

1) High bionic freedom and fine operation

16 degrees of freedom in the whole hand, 21 joints (16 active joints+5 passive joints), and 16 active joints realize precise control of each joint of the fingers through independent drive, and can complete fine movements such as grasping and pinching; 5 passive joints rely on elastic structures to adaptively fit objects, reducing damage to fragile workpieces and improving gripping stability. Active and passive joints work together to ensure operational accuracy, enhance scene adaptability, and be close to the

natural operation texture of human hands.

2) Multimodal perception and intelligent interaction

It can be equipped with force sense, vision, and electronic skin sensors to accurately sense contact force, object shape and close-range images, improving environmental adaptability and interactive intelligence.

3) Device-cloud convergence and zero-code rapid deployment

Relying on the device-cloud architecture, users can call deployment tasks with one click through the cloud skill library, lowering the threshold for use and improving the efficiency of development applications.

4) High reliability and data support

The structure is sturdy and impact-resistant, suitable for high-intensity training and industrial scenarios; Support self-developed data collection to provide support for data farm construction and algorithm optimization.

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)

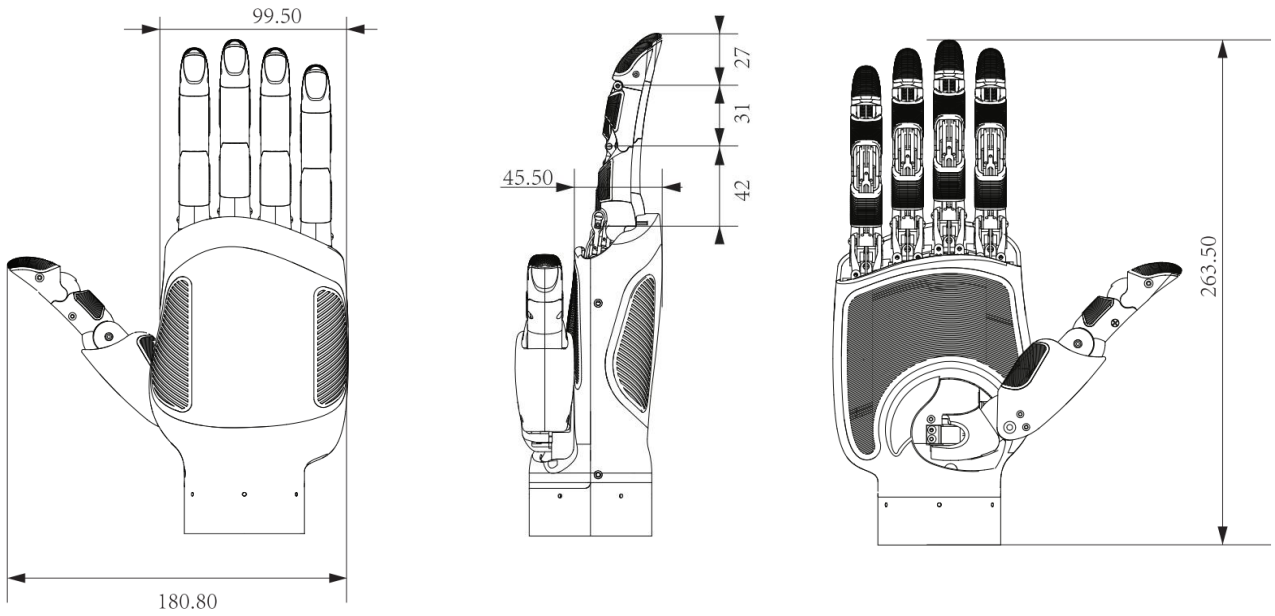
With the help of the fingertip sensor to sense and accurately control the force and

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.

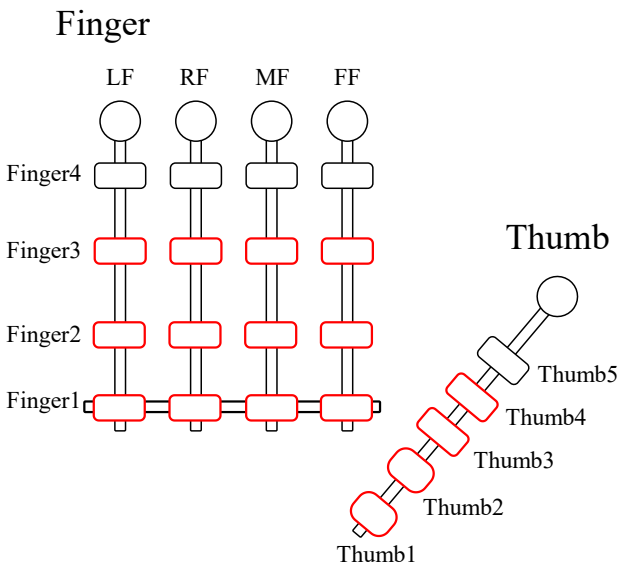
1.2 Appearance Dimensions



Dimensions (mm)

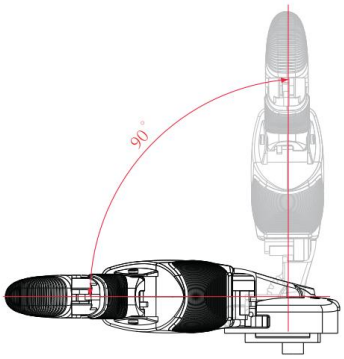
1.3 Degrees of freedom and range of motion

It has 16 degrees of freedom and 21 joints, of which 16 are active and 5 passive, as shown in the figure below.

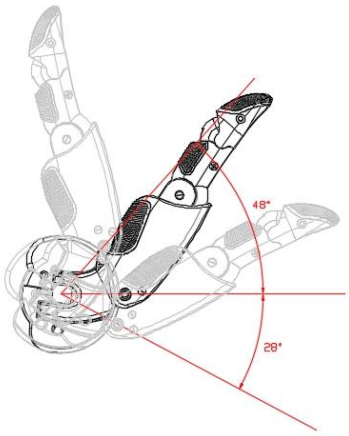


Joint degree of freedom diagram

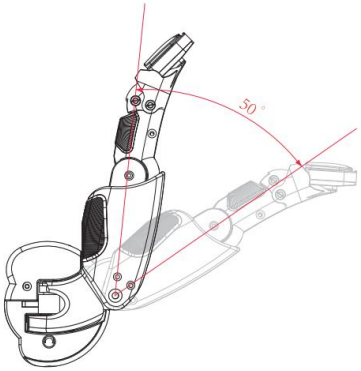
The following is the maximum range of structural activities for this product. The actual range of controlled activities is limited to prevent structural collisions, so the actual range of activities may be less than the following range of activities.



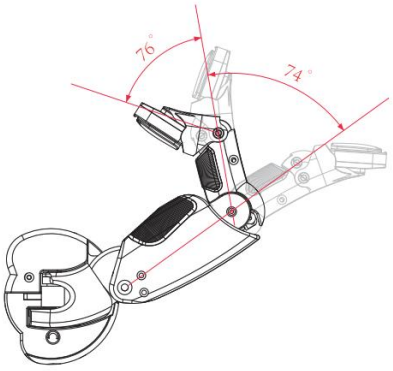
Thumb Side Pendulum Angle Schematic



Thumb Rotation Angle Diagram

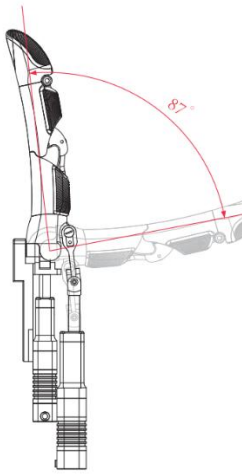


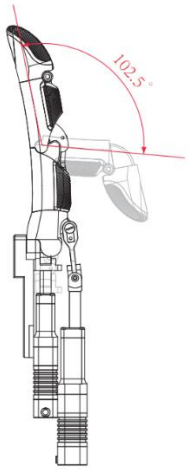
Thumb 1 Joint Angle Diagram

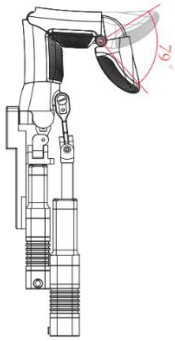


Thumb 2-3 Joint Angle Diagram

Four-finger side pendulum angle. Schematic.







Schematic diagram of the bending angle of the first, second and third joints of the fourth finger

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

Joints	Angle of motion (°)	Movement speed (°/s)
THUMB1 (Rotation)	76	111.81
THUMB2 (Side Swing)	90	188.17
THUMB3 (Bending)	48.5	41.32
THUM4 (Bending)	69.3	62.26
THUMB5 (Bending)	72.2	-
LF2, RF2, MF2, FF2 (Kyphosis)	85.9	73.91
LF3, RF3, MF3, FF3 (Kyphosis)	101.9	114.29
LF4, RF4, MF4, FF4(Bent)	79	-
FF1, MF1, RF1, LF1 (Side Swing)	±10	113.37

1.4 Product Parameters

1.4.1 Basic Parameters

Model	Left hand L20
Degrees of freedom	16
Number of Joints	21 (16 active + 4 passive)
Transmission Method	Connecting rod. Drive.
Control Interface	CAN/RS485
Communication Rate	600 kHz
Weights	1100g
Maximum load	10 kg
Operating voltage	DC24V±10%
Quiescent current	0.2A
No-load motion average current	1A
Maximum current	3A
Repeat Positioning Accuracy	±0.2mm
opening and closing time	1.2s

1.4.2 Force performance parameters

Performance Indicators	Specific Parameters
Maximum thumb tip force	18N
Maximum four-finger fingertip force	20N
Five fingers Maximum grip strength	100N

1.5 Sensors Systems

1.5.1 Tactile Sensors

The Linker Hand L20 is equipped with fingertip sensors that anticipate and sense the presence and distance of objects,when in contact, it accurately captures

three-dimensional forces and recognizes surface texture and temperature changes.

1) Pressure Sensitive Sensors

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
Numerical range	0~4095

2) Capacitive sensor (optional)

Parameters	Specification
Sampling frequency	⩾ 50Hz
Measuring range	0-30N
Overload limit	60N
Pressure sensitivity	0.1N
Measurement resolution	0.5%FS
Measurement accuracy	2%FS
Pressure resolution	0.25N
Directional resolution	45°
Detection distance	1cm (metal, human body)

1.5.2 Vision (optional)

Adopting the design of high sensitivity cameras at fingertip, palm and wrist to realize multiple visual fusion perception; for the smallest teleoperated system, the arm is additionally equipped with a depth camera to further improve the visual perception capability.

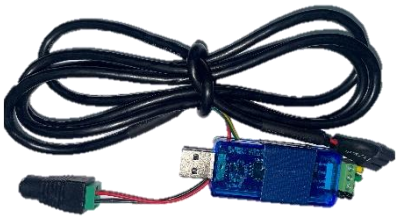
1.5.3 Visual and tactile perception (optional)

The visual-tactile perception model essentially integrates visual perception and deep learning large model technology. The principle of the program is: through the high-precision camera to capture the deformation of the variable flexible material, when the material is subjected to force, the surface grid will change its shape, the micro binocular camera will record the deformation process in real time, and then with the help of the trained deep learning model, accurately mapping the depth of the object information and the trend of movement.

2 Installation and Commissioning

2.1 Accessory List

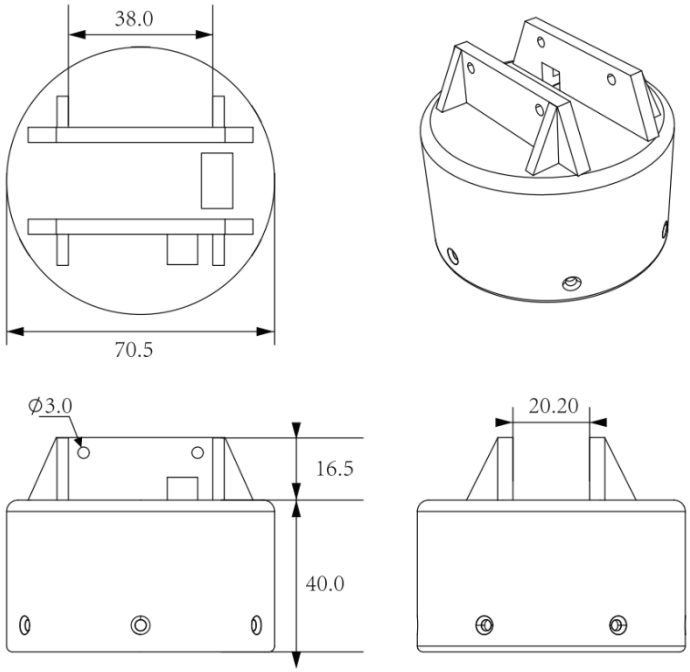
Before installing the product, check that the accessories are complete.

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

2.2 Installation Instructions

2.2.1 Structural installation instructions

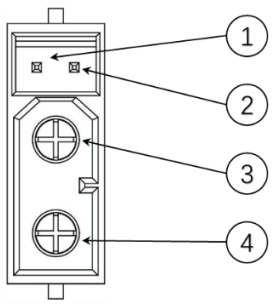
M3 screws are required for mounting, the length of which is adjusted according to the thickness of the fixing parts, and the structure of the mounting flange is shown below.



Flange Structure Diagram

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

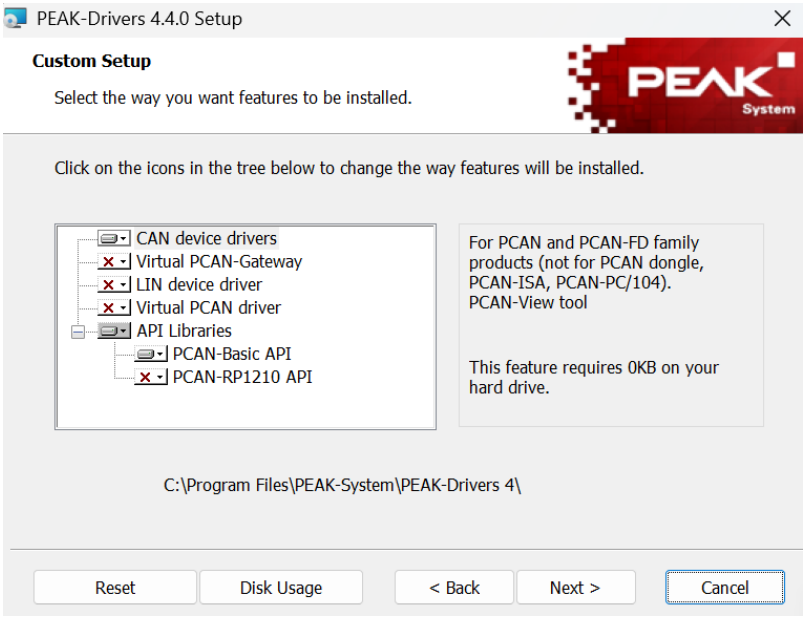
2.3.1 Commissioning Preparation

1) Debug Cables Connections

The USB to CAN debugging cable will be used to connect the Dexterous Hand to the debugging PC, plug the power cord with the power adapter and plug it into the power port of the USB to CAN debugging cable, and plug the other end into the AC220V plug;

2) USB to CAN Driver Installation

Open the file name PEAK- System_Driver -Setup and install the driver file step by step (Windows system needs to install the driver, Linux system does not need to install), after the driver is installed for the first time, it does not need to be installed again for the next use;



3) Upper computer software configuration

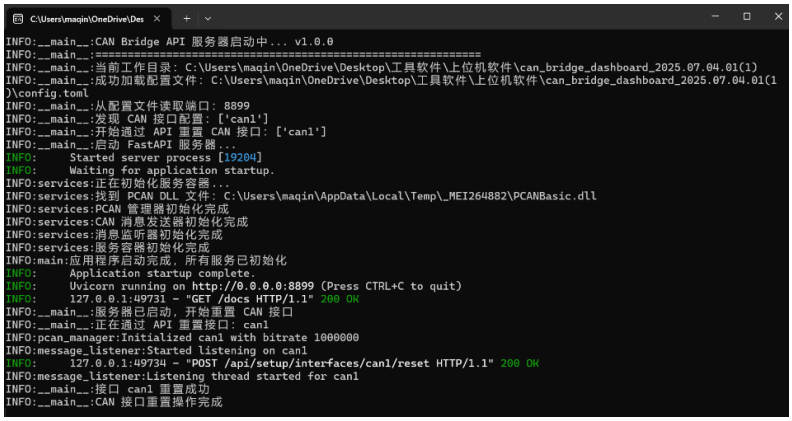
Before starting the program, we need to update the configuration file with the number of CANs of the connected devices because of the limitations of the Windows system.

Open the can_bridge_dashboard folder, modify the can_interface field in the config.toml configuration file, write the number of can devices to the number of digits, for example: can_interface = ["can1"] # one device # or

can_interface = ["can1", "can2"] # two devices, modify and save. "can2"] # two devices, modify and save.

4) Start the adapter service program (CAN Bridge)

Double-click on the can_bridge.exe file to run it: if it runs correctly, we will be able to see information about the address where a service is running.

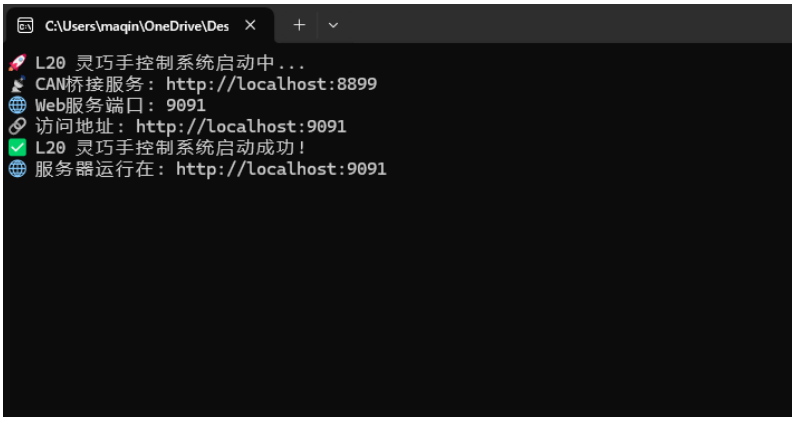


If a runtime error is encountered, the program will log the exception in the can_bridge.log log file, and you can send the log content back to your after-sales engineer for support information.

Due to the limitations of Windows, each time we plug in a can device, we need to close the previous can-bridge program and do a program restart.

5) Dashboard to launch different dexterity devices

Double-click the dashboard.exe file corresponding to the running model, and wait for the program to finish running, that is to say, the console program



starts.

Open http://localhost:909 1 in your browser to access the console and control the Dexterity.

2.3.2 Upper computer software description

The main functions of the Linker Hand L 20 PC software include device information, preset gestures, gesture dances, slide control, motor control, and control logs, etc. The pages are shown in the figure below.

1) Equipment Information

As shown in the figure below, you can select the port number and hand type, and display the online/offline status of the dexterous hand.

2) Presets Gestures

You can preset fist, open, and numeric gestures in the Preset Motion field.

3) hand gesture dance

You can do countdown, Mexican wave, finger wave, piano playing and other gesture dances, and you can stop the gesture dance at any time.

4) Slide Control Control

The control slider allows you to control the fingertip and root movements of each finger, as well as the horizontal swing of the finger .

5) Control log

In the Status Monitor column, you can view the device's real-time logs, hand status, sensor data, and more.

6) motor control

Used to control finger speed, overcurrent thresholds, blocking count thresholds, etc.

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.

Appendix

SDK Acquisition Path：https://github.com/linker-bot/linkerhand-ros-sdk
Technical Support Email：support@linkerbot.cn
For additional technical support, please visit the company's official website：
https://linkerbot.cn

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