Revo 2
BrainCo Dexterous Hand
Product Manual

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Version History

Date	Version	Description
2025-07-03	1.0	First Version Product Manual of Revo 2 Basic Hand
2025-07-09	1.1	Updated Product Size and Packaging List
2025-09-09	2.0	Update Protocol、Tactile Sensor and Packaging List,document title has been updated to“Revo 2 Dexterous Hand Product Manual ”
2025-09-09	2.1	Updated Interfaces Size and Packaging List

Table of Contents

1 Precautions

(1) BrainCo Intelligent Dexterous Hand cannot sense temperature or humidity. It is strictly prohibited to place it in high-temperature or high-humidity environments.

(2) Do not subject the BrainCo Dexterous Hand to excessive loads or impacts.

(3) Do not apply excessive force to the fingertips.

(4) Do not pull the fingers of the BrainCo Dexterous Hand forcefully.

(5) Keep the BrainCo Dexterous Hand away from flames.

(6) Do not place the BrainCo Dexterous Hand in flammable or explosive environments.

(7) Do not use it in strong electromagnetic fields, such as near high-voltage power lines or high-power machinery.

(8) Do not use the BrainCo Dexterous Hand to grasp objects that are too heavy, hot, sharp, rough, or corrosive.

(9) Without protection, avoid contact with liquids (alcohol, water, beverages, etc.) or dust. If contact occurs, turn it off immediately and contact after-sales service.

(10) Do not disassemble the BrainCo Dexterous Hand without authorization, as this will void the warranty. For any malfunctions, contact after-sales service.

(11) Do not use the BrainCo Dexterous Hand to operate dangerous machinery. Our company is not responsible for any personal injury or property damage caused by such actions.

2 Product Introduction

2.1 Core Features

Revo 2 Dexterous Hand is an upgraded iteration based on mature Intelligent Bionic Hand and Revo 1 Dexterous Hand technologies, inheriting the stability and high performance of its predecessor. Revo 2 Dexterous Hand features 6 built-in coreless-motors, 6 active joints, and 11 degrees of freedom (DoF). With a single-hand weight of 383g, a length of 160mm, an active grasp force of 50N, and a single-hand load capacity of 20kg, it achieves a light-weight and compact design with powerful load capacity and a bionic, aesthetically pleasing appearance.

Figure 1 Degrees of Freedom Introduction

Revo 2 Dexterous Hand can be equipped with Multi-Modal Tactile Perception, boasts industry-leading mass production stability, and is highly reliable. It supports multiple communication interfaces including 485, CAN FD, and EtherCAT, with communication speeds up to 1KHz for high-speed real-time communication. SDK support enables compatibility with Linux, Windows, and ROS, facilitating rapid secondary development. Features include customizable gestures, multi-layer protection, servo control algorithms, tactile adaptive grasping, OTA online upgrades, and more, aiding in the swift implementation of dexterous applications.

2.2 Product Appearance

Figure 2 Revo 2 Flowing Silver Appearance

Figure 3 Revo 2 Space Gray Appearance

2.3 Product Dimensions

Figure 4 Product Dimensions

No.	Definition	Unit
1	Hand Length (from middle fingertip to palm base)	160mm
2	Maximum Palm Width	78.5mm
3	Thumb Length	92mm
4	Wrist Height	13.5mm
5	Wrist Diameter	38mm

3 Product Specifications

Revo 2 Dexterous Hand is available in three versions: Basic, Pro, and Touch.

Parameters	Revo 2 Basic	Revo 2 Pro	Revo 2 Touch
Degrees of Freedom	11（6 Active Joints）		
Weight(without wrist))	383 g		
Hand Length (from middle finger tip to palm base)	160 mm		

Power Grasp Force	≥50N		
Finger Pinch Force	≥15N		
Static Load	≥20kg		
Running Noise(50cm)	≤50dB		
Time to Open/Close	≤0.65s		
Standard Port	485 CANfd	485 CANfd EtherCAT	485 CANfd EtherCAT
Voltage	12-28V	12-64V	12-64V
MultiModal Tactile Perception	NA	NA	Pressure, Friction, Force Direction, Proximity
Repeat Accuracy	0.1°		
Maximum opening distance	100mm（thumb to index finger）		
Operating temperature	-10 - 40℃ / 90%RH		
Materials	Aerospace-grade Aluminum Alloy & Food-grade Plastic		
Control Algorithm	Position,Speed,Current Control Adaptive Impedance Control Adaptive Compliance Control		+Adaptive Tactile Control
Intelligent Protection	Overcurrent Protection , Overvoltage Protection, High-temperature Protectoin , lmpact Protection		
Secondary Programming	SDK supports Python/C , supports Linux/Windows/ROS system		
Upgrade	OTA		

4 Communication Interfaces and Protocols

4.1 Communication Interfaces

Revo 2 Basic Dexterous Hand supports two external communication interfaces: RS485 and CAN FD.

Figure 5 Revo 2 Basic Communication Interface

The Revo 2 Pro and Touch Dexterous Hands support three external communication interfaces: RS485, CAN FD, and EtherCAT.

Figure 6 Revo 2 Pro & Touch Communication Interface

4.2 Mechanical Interface Dimensions

The wrist interface is fixed circumferentially with 4 M3 screws. Wrist interface drawings and 3D-models can be downloaded from the online documentation center via the link below:

https://www.brainco-hz.com/docs/revolimb-hand/revo2/download.html

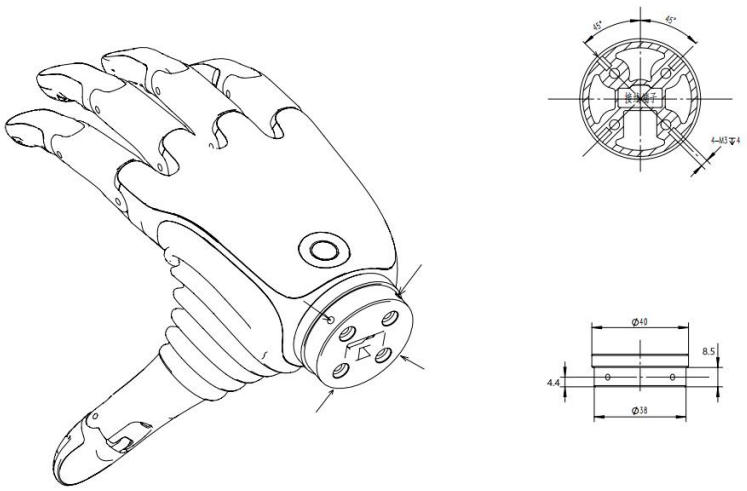

Figure 7 Revo 2 Basic Wrist Mechanical Interface Dimensions

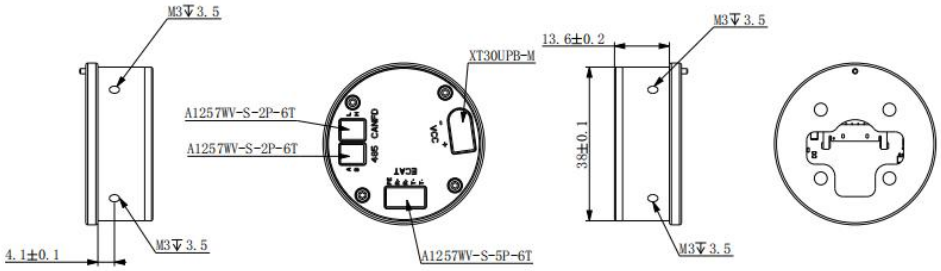

Figure 8 Revo 2 Pro & Touch Wrist Mechanical Interface Dimensions

Note: For Revo 2 Pro&Touch Dexterous Hands, the depth of the threaded through-hole on the wrist flange is 3.5 mm. It is recommended that the screw penetration depth into the wrist end be less than 3 mm to avoid damaging the internal circuit board with excessively long screws.

4.3 Communication Protocols

4.3.1 Modbus-RTU/CANFD Protocol:

This protocol is used for the robotic dexterous hand. The protocol content is fully open, allowing direct control of various hand functions through this protocol, as well as control via SDK and PC software. Under this protocol, multiple dexterous hands or other devices can be connected to a single bus, increasing versatility. The design ensures compatibility, creating a protocol compatible with both 485 and CAN FD communication interfaces, guaranteeing efficiency, reliability, and ease of expansion across different communication protocols.

Modbus-RTU is a master-slave request-response communication protocol widely used in industrial automation systems. The protocol frame includes address, function code, data field, and CRC check to ensure communication reliability.

1) RS485 compatibility with Modbus RTU: RS485 itself does not define a specific communication protocol but is typically paired with the Modbus RTU protocol, widely used for data transmission in industrial automation and monitoring systems.

2) CAN FD compatibility with Modbus RTU: CAN FD uses extended frames with a fixed arbitration baud rate of 1 Mbps. The frame ID in the CAN FD protocol's data field can include Device ID, Master ID, and data length, while the data field contains the entire Modbus RTU format.

3) Additionally, the Revo 2 Basic Dexterous Hand can switch between CAN FD and Modbus-RTU protocols via a DIP switch located under the wrist cover (requires disassembly). Switch to the CAN FD side for CAN FD protocol and to the Modbus-RTU side for Modbus-RTU protocol.

The second-generation hand currently has three versions:

V2-BASIC：Revo 2 Dexterous Hand - Basic

V2-PRO：Revo 2 Dexterous Hand - Pro

V2-TOUCH：Revo 2 Dexterous Hand - Touch

Note：For more information on the Revo 2 Dexterous Hand Modobus/CANFD communication protocol, please click the link below to access the documentation center. Different protocol apply only to corresponding hand models. If you are unsure of the hand model or version, please contact BrainCo technical support in advance.
https://www.brainco-hz.com/docs/revolimb-hand/revo2/introduction.html

4.3.2 EtherCAT Protocol：

This protocol is used for the robotic dexterous hand. EtherCAT communication offers advantages such as high real-time performance, low latency, and precise synchronous control. Adopting the EtherCAT protocol meets the rigid requirements for real-time control of high-DoF dexterous hands. Dexterous hand integrates multi-modal sensors like force and touch, generating substantial data volume. EtherCAT's efficient data encapsulation and hardware-level timestamps enable synchronous processing of joint control and sensor feedback, avoiding the complexity of using multiple protocols.

Revo 2 Pro and Touch Dexterous Hands support EtherCAT communication. If you are unsure of the hand model or version, please contact BrainCo technical support in advance. For more information on the Revo 2 Dexterous Hand EtherCAT communication protocol, please click the link below to access the documentation center:

https://www.brainco-hz.com/docs/revolimb-hand/revo2/EtherCAT.html

5 Tactile Sensor

5.1 Capacitive Sensor

The fingertips of the capacitive Revo 2 Tactile Dexterous Hand are each equipped with a capacitive tactile sensor. Due to structural differences between each finger, their arrangement varies slightly. However, each finger collects data through six channels, outputting a set of three-dimensional force and proximity force measurements respectively.

NO.	Definition	Spec.
1	Perception Dimension	Pressure, Friction, Force Direction, Proximity
2	Range	0 - 25N
3	Communication Frequency	>50Hz
4	Communication Interface	I2C
5	Force Resolution	0.1N
6	Proximity Distance	0 - 1cm

5.2 Piezoresistive sensor

The Piezoresistive Revo 2 Tactile Dexterous Hand is equipped with 9 sampling points on each finger, distributed along the direction from the fingertip to the finger base. This design enables comprehensive perception of tactile feedback on the finger surface. Users can read the 9-point pressure values of each finger via registers and retrieve the firmware version string (10 bytes). Additionally, the module can be enabled or disabled by controlling the tactile data switch register, thereby optimizing resource usage.

6 Packaging List

Revo 2 Basic Edition package includes one dexterous hand and one 485/CANFD communication cable as standard. If needed, additional tools such as 485-to-USB debugging module, CAN FD-to-USB debugging module, and others can be optionally purchased.

Figure 9 Revo 2 Basic Unboxing Diagram

Revo 2 Pro Edition and Touch Edition packages include one dexterous hand, one 485/CANFD communication cable, one power cable, and one EtherCAT communication cable as standard. If needed, additional tools such as 485-to-USB debugging module, CAN FD-to-USB debugging module, and others can be optionally purchased.

Figure 10 Revo 2 Pro&Touch Unboxing Diagram

The detailed list of standard configurations and optional tools is shown in the table below:

Standard Lists	Name	Figure	QTY
Dexterous Hand	Revo 2 Dexterous Hand		1
Standard Communication Cable (Revo 2 Basic)	485/CAN FD Communication Cable		1
Standard Communication Cable (Revo 2 Pro/Touch)	485/CAN FD Communication Cable		1
	Power Cable		1
	EtherCAT Communication Cable		1
Optional Tools			
485-USB Debugging Module	Dual-Port 485 to USB Converter*1, 1.15m 485 Communication Cable*2, Typec-c Cable*1		1
CAN FD-USB Debugging Module	Single-Channel USB-CAN(FD) Analyzer*1		1

EtherCAT Debugging Module	EtherCAT - RJ45 Cable*1		1
Power Adapter	XT30 Interface 24V Power Adapter * 1		1

Note:Communication cable inside the package is standard-equipped according to the dexterous hand version.

7 After-Sales Information

(1) BrainCo Dexterous Hand is warranted for 1 year from the date of purchase.

(2) Cosmetic wear not affecting normal use is not covered under warranty.

(3) Returns or exchanges are not accepted for non-quality-related issues.

(4) For any malfunctions, contact designated BrainCo after-sales service personnel.

8 PC Software Instructions

Download Link:
https://www.brainco-hz.com/docs/revolimb-hand/revo2/download.html

Note: The PC Software and Firmware are only compatible with their corresponding dexterous hand model. If you are unsure of the hand model or version, please contact BrainCo technical support in advance.

9 SDK Instructions

(1) SDK Download and Examples
https://github.com/BrainCoTech/stark-serialport-example

(2) Python SDK User Guide
https://www.brainco-hz.com/docs/revolimb-hand/revo2/python_sdk.html

(3) C++ SDK User guide:
https://www.brainco-hz.com/docs/revolimb-hand/revo2/c_sdk.html

10 Disclaimer

Prior to using the products of our company, you must carefully read the Precautions to ensure that you have fully read, understood, and completely accepted all terms and content of the Precautions and this Disclaimer before use. Our company may update the content of this document, and the updated content shall take effect from the date of publication. Please check regularly for updates. If you have any questions or objections regarding this Disclaimer, please contact us or the distributor in your country before using the product.

I.Usage Guidelines

You agree and guarantee that using the product solely for lawful and legitimate purposes. During the use of the product, you shall strictly comply with all requirements set forth in this Disclaimer, the Precautions, and other related documents. YOU HEREBY AGREE THAT UNDER THE FOLLOWING CIRCUMSTANCES, OUR COMPANY SHALL BE EXEMPT FROM ANY AND ALL RESPONSIBILITIES, AND ALL RELATED LIABILITIES AND LOSSES SHALL BE EXCLUSIVELY BORNE BY YOU.

1.Any personal injuries, accidents, property losses, legal disputes, or any other adverse events resulting from conflicts of interest caused by your improper operation of the product or due to force majeure (including but not limited to natural disasters, war, government actions, etc.);

2.Your direct or indirect use of the product to engage in any activities that violate the laws and regulations of the country/region

where the product is sold;

3.Your unauthorized disassembly, modification, or non-compliant repair of the product;

4.Your failure to use the product in accordance with this manual.

II. Export Control and Compliance Commitments

1.You undertake to strictly complying with all applicable export control laws and regulations of the country/region where the product is sold, and refrain from engaging in any activities that violate export control provisions;

2.You undertake not to use the functions or services of this product for any purposes that endanger national security and interests, including but not limited to supporting terrorism, use in nuclear facilities, biological or chemical weapons for military purposes, as well as the design, development, production, or use of weapons of mass destruction and their delivery vehicles;

3.You confirm that you are not subject to any trade restrictions, sanctions, or other legal or regulatory limitations imposed by any country, international organization, or region.

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