Dexta Robotics Inc.

DEXMO Development Kit 1

User Manual [V2.4]

2017.05

Introduction

Dexmo^{TM} Development Kit 1 (DK1) is the lightest full hand force feedback exoskeleton in the world. Within the Red Dot Design Award winning body, Dexmo captures all hand motions with 11 degrees of freedom (DoF) and provides virtual force feedback. With Dexmo, you can feel the size, shape and stiffness of virtual objects. A uniquely designed Torque Output Monitoring feature ensures safety during operation.

Development for Dexmo is as easy as it can be. With our SDK and document support, any developer could start developing for Dexmo within a day.

Features

Motion capture ability

Dexmo captures full range of the users' hand motion, including a 3DoF thumb motion capturing module that captures the rotation, splitting and bending of the thumb as well as four 2DoF finger motion capturing modules that capture the splitting and the bending of the rest four fingers.

Variable force feedback

The force feedback ability allows the user to feel the size and shape of any digital object. The motors stop users' finger rotation according to the digital avatars' hand interaction within the digital world, which greatly improves immersion. By precise motor control, Dexmo is also capable of generating variable force output, letting the user feel change of stiffness and tell the difference between a rock and a rubber ball by just squeezing them.

Multiple stiffness layers simulation

Combining the software control with the variable force feedback ability, developers can easily describe an object's stiffness through LibDexmo and achieve complex haptic sensation. When there is a change in stiffness, sensation such as the press of a button and cracking of an egg can be achieved.

Safety enhancement

Dexmo is designed to be safe. The Torque Output Monitoring function monitors user's finger force applied and disables all motor functions under abnormal circumstances. Also, the maximum torque output of each finger force feedback module is clamped to 3kg.cm (0.3N.m). A human finger can provide an average torque of 7kg.cm (0.7N.m). So Dexmo will never cause injury.

Platform support

Dexmo comes with its own SDK, LibDexmo. Along with the Unity plugin we wrote, Dexmo works with Oculus CV1, HTC Vive, PSVR, Hololens and potentially any other VR/MR solutions that supports Unity development.

Wireless communication

With 2.4GHz wireless modules and our optimized communication protocols, an overall latency of 20-50ms is achieved, allowing Dexmo to work wirelessly within 5 meters from the dongle, which frees our hands from tethers.

Light weight & wearable

Thanks to the light-weight design of motors, Dexmo weighs only 320g, whereas existing products offer similar functionalities usually weigh 10 times as much. It enables users to comfortably wear Dexmo, and ignore its presence when exploring in VR.

Up to 6 hours of battery life

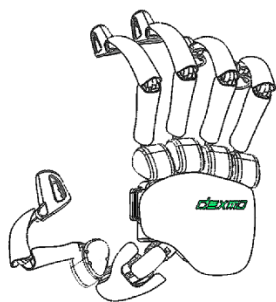With the reliable and powerful 2000mAh LiPo battery modules, Dexmo can work wirelessly for 6 hours under normal use.

In the Box

Check that all of the following items are in your box.

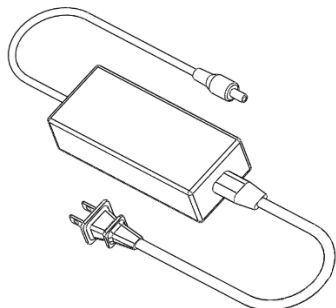If any item is missing, please contact us via email: *support@dextarobotics.com.*
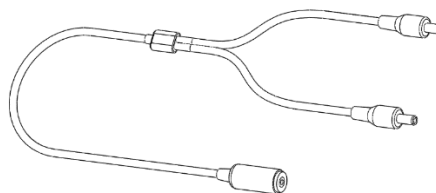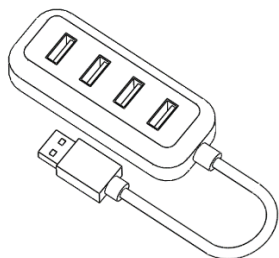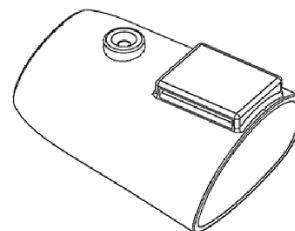
Dexmo × 2
(Left & Right hand)

Dongle × 2
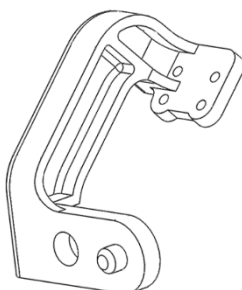(One for each hand)

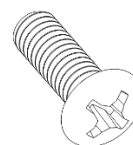**Power Adaptor × 2**

1-to-2 Power Cord Splitter × 1

1-to-4 USB 2.0 Hub × 1
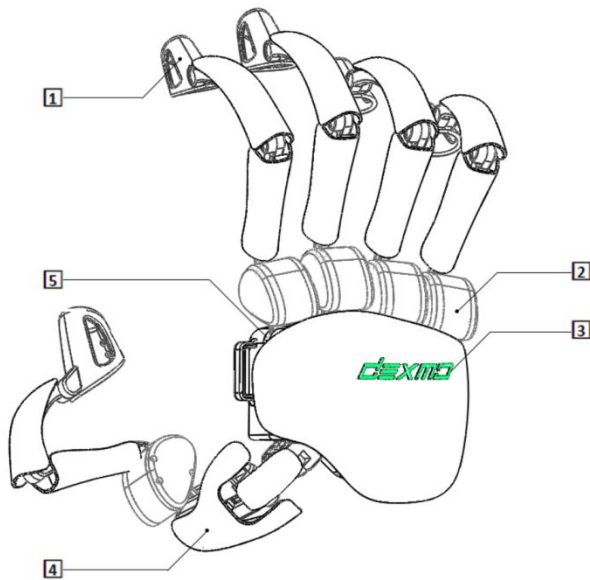
Vive Controller Connector × 2

Vive Tracker Connector × 2

Screws × 10
(2 × 8 mm)

Parts and Controls

1 Fingertip Cap

Stables users' finger comfortably. (Also comes with finger strips in the box.)
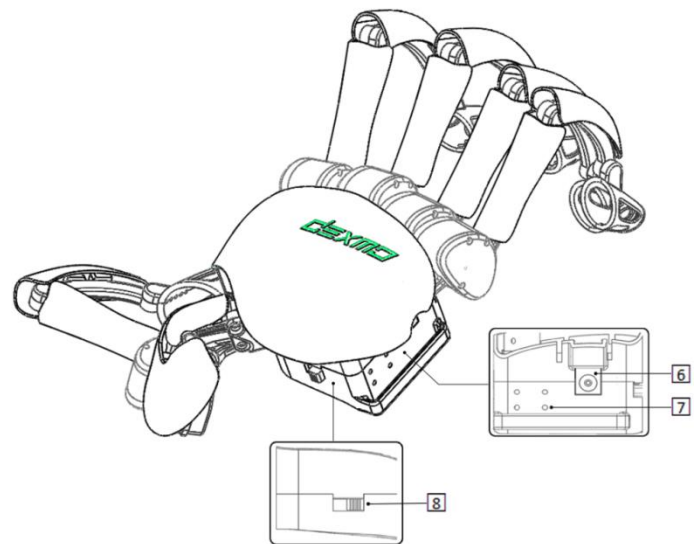
2 Motor With Motion Capturing Module

Captures finger bending motions and provides variable force feedback & multiple stiffness layers simulation.

3 Status Indicator

Communicates the status of Dexmo. Refer to the table in Specifications section for more information about Status Indicator.

4 Thumb Motion Capturing Module

Captures thumb motions with 3 DoF: rotation, splitting and bending.

5 Motion Capturing Module

Captures finger splitting motions.

6 DC Input 5V Jack

Connects to power adaptor to start charging.

7 Mounting Holes

Allows external accessories to be mounted onto Dexmo. Supports Vive Tracker Connector in the box.
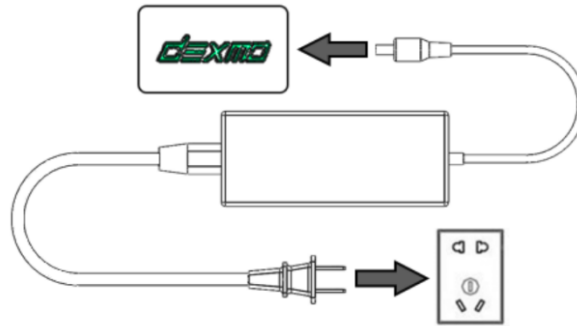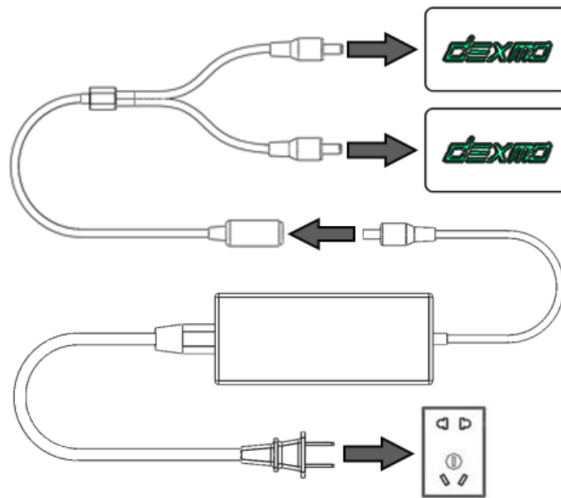
8 Switch

Turns ON/OFF Dexmo.

Operating Instructions

Step 1: Charging Dexmo

- Make sure both Dexmo are turned off.
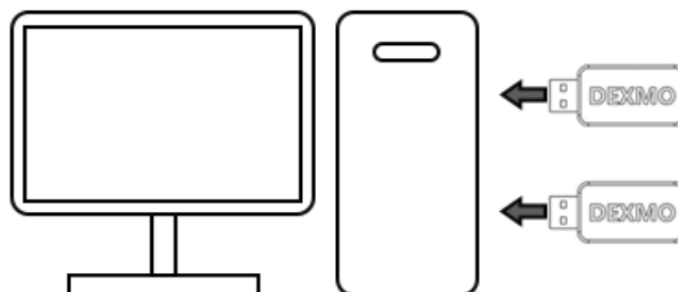- Plug the power adapter into Dexmo to start charging. Status indicator will flash when fully charged.

- To charge both Dexmo simultaneously, connect the 1-to-2 power cord splitter to the power adapter.
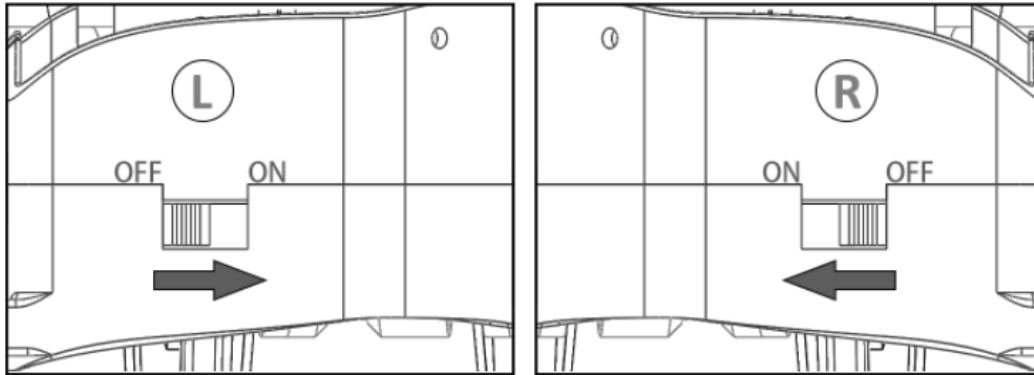
Step 2: Connecting Dexmo

- Plug both dongles into computer.

● Turn on both Dexmo by pushing switches to ON side.

Operate Dexmo with Power Adapter (optional)

● In the case of low battery, Dexmo may also operate with the power adapter plugged in.
● Make sure both Dexmo are turned OFF*, then connect Dexmo separately to power adapters.
* *Dexmo will work when left on, however for optimal performance, please turn off Dexmo when operating with power adapter.*

Step 3: Connecting to Server

● Download and install server.
● Make sure all hardware is connected properly.
● Follow instructions on HOW-TO-START-DEXMO* to set-up Dexmo.
Links to download DexmoServer and HOW-TO-START-DEXMO will be provided after your purchase.

Step 4: Develop with Dexmo

● Dexmo comes with its own SDK, LibDexmo and a Unity Plugin that enables development on any VR/MR devices that supports Unity Development. E.g. Hololens, Oculus CV1, HTC Vive and PSVR.
Links to download LibDexmo along with instruction will be provided after your purchase.

Specifications*

General	
Size	155 × 100 × 7.5 mm (L × W × D)
Weight	~320 g
Working Temperature	-10°C ~ 60°C
Power	
Battery	LiPo
Battery Capacity	2000 mAh
Battery Life	6 hrs
Charge Time	1.5 hrs
Power Consumption (Max.)	25000 mW
Power Consumption (Avg.)	5000 mW
Adaptor Input	100-240 V (50-60 Hz)
Adaptor Output	5V ⎓ 6A
Motor	
Torque (Max.)	3 kg.cm (0.3 N.m)
Current (Max.)	1 A
Power Consumption (Max.)	4000 mW
Wireless Communication	
Communication Range (Optimal)	2 m
Communication Range (Max.)	5 m
Frequency Transmission Range	2.4G Hz
Status Indicator	
Lights On	Dexmo is turned on.
Lights Off (when switch is ON)	Dexmo is out of power.
Breathing	Dexmo is charging.
Flashing	Dexmo is fully charged.

Specifications described in this section is for one hand only.