Dexta Robotics Inc.

DEXMO Development Kit 1

User Manual [V3.0]

2019.5

Introduction

Dexmo 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 abilities

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 captures 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 outputs, letting the user to 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 abilities, developers can easily control an object's stiffness through LibDexmo and achieve complex haptics 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 5kg.cm (0.5N.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, which works in any simulated 3D environment. Users can use it with Oculus, HTC Vive, PSVR, Hololens and potentially any other VR/MR solutions. We have a plugin specifically build for Unity, making the development process even easier.

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 300g, 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 8 hours of battery life

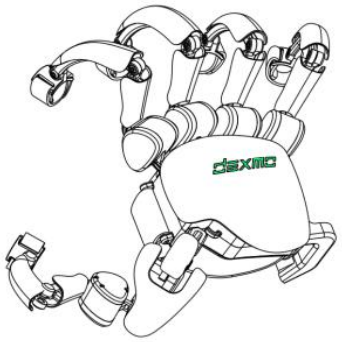
With a reliable and powerful 1800mAh LiPo battery, Dexmo can work wirelessly for 8 hours under normal use, and over an hour under intensive use.

In the Box

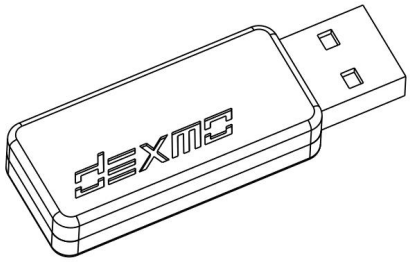
Check that all of the following items are in your box.

If any item is missing, please contact us via email: *support@dextarobotics.com.*

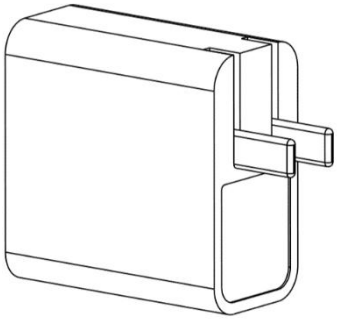
Dexmo × 2
(Left & Right hand)



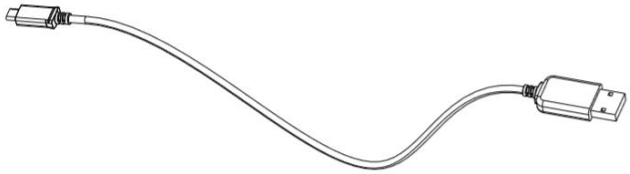
Dongle × 2
(One for each hand)



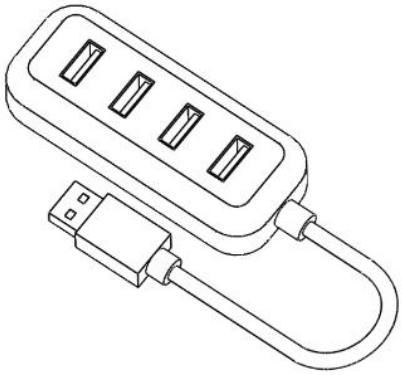
Power Adaptor x 1



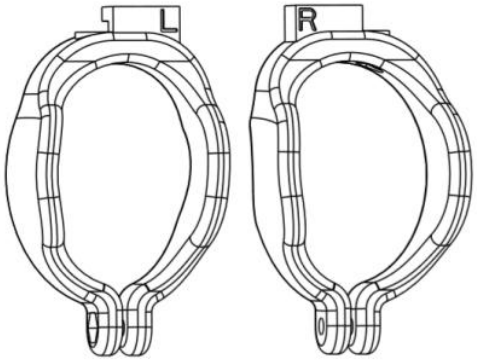
USB Type-C Cable x 2



1-to-4 USB 3.0 Hub × 1

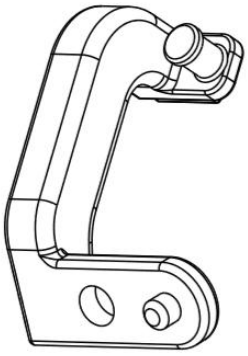


Vive Controller Connector × 2

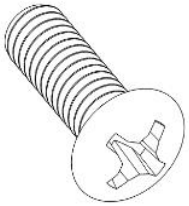


In the Box

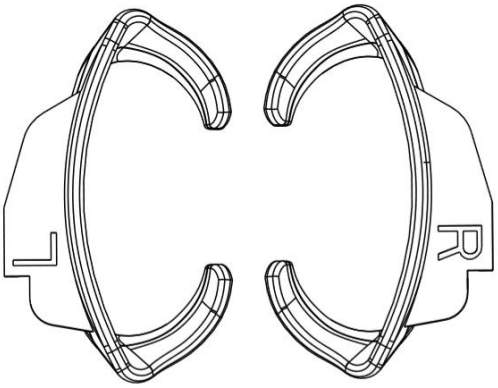
Vive Tracker Connector × 2



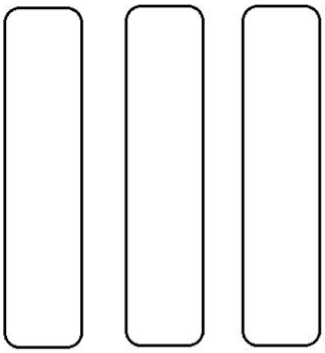
Vive Tracker Fixing Screws × 2 & Other Screws × 10



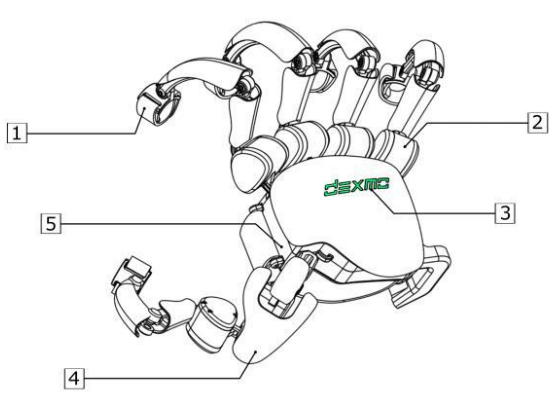
Oculus Controller Connector × 2

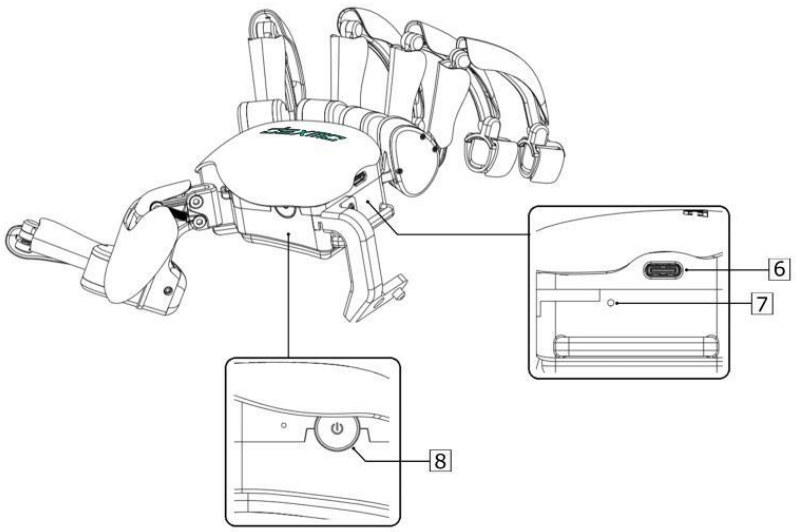


Finger Straps × 10



Parts and Controls





1 Finger Strips

Stables users' finger comfortably.

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

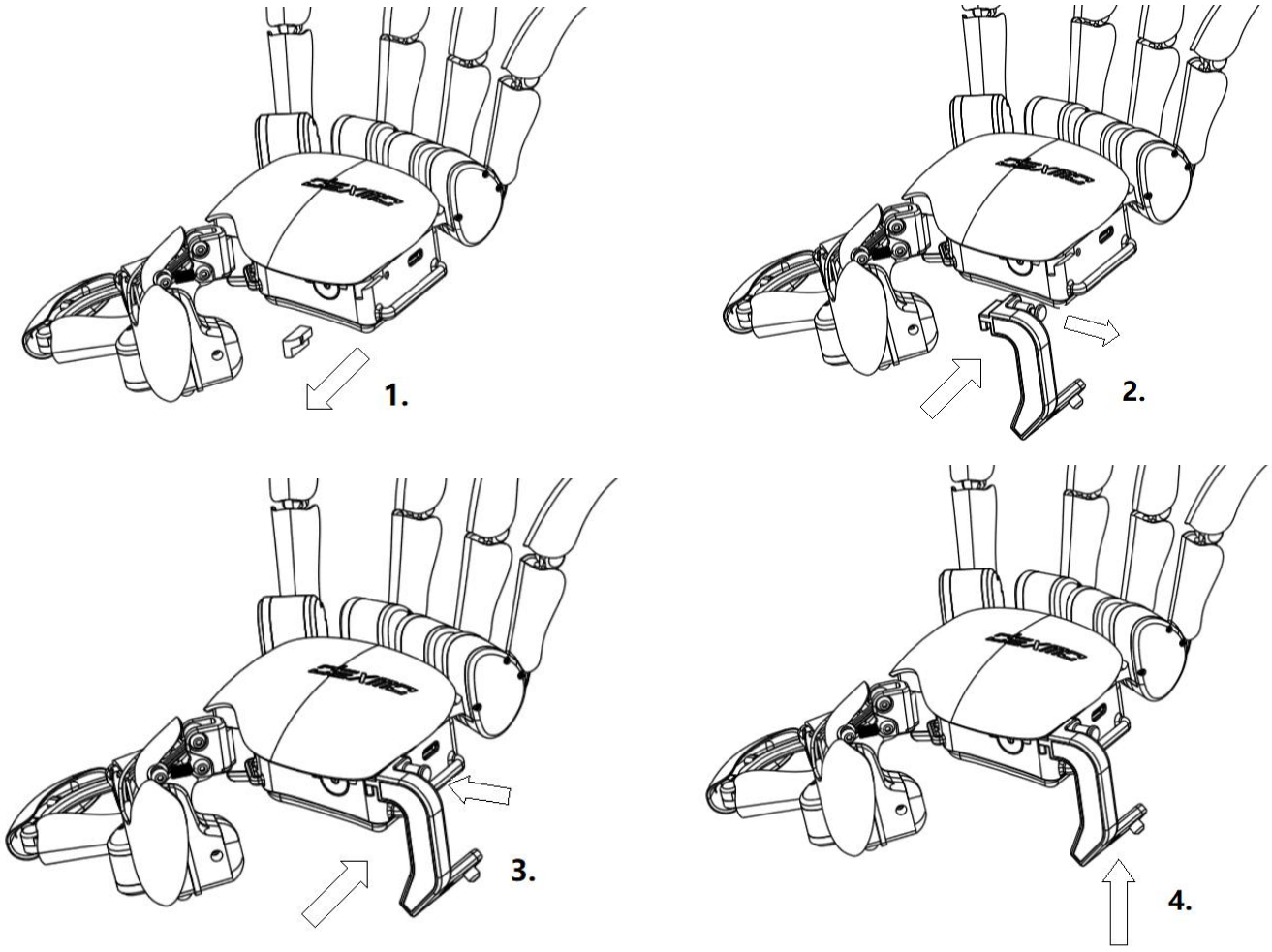
Connects to power adaptor to start charging.

7 Mounting Holes

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

8 Switch Button

Turns ON/OFF Dexmo.(To swtich ON or OFF, press and hold the button for a few seconds until indicator lights are ON or OFF)



Installation of Vive Tracker

1. Remove the protection plug from the sliding groove.
2. Pull up the Fixing Pin and hold, then slide the connector into the sliding groove on Dexmo main body.
3. Release the Fixing Pin, make sure the connector is fully fixed.
4. Install Vive Tracker onto Tracker Connector and screw in the Fixing Screws (This step can also be done before step 1).

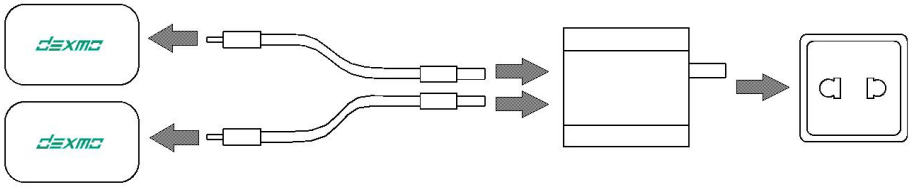
Operating Instructions

Step 1: Charging the Dexmo

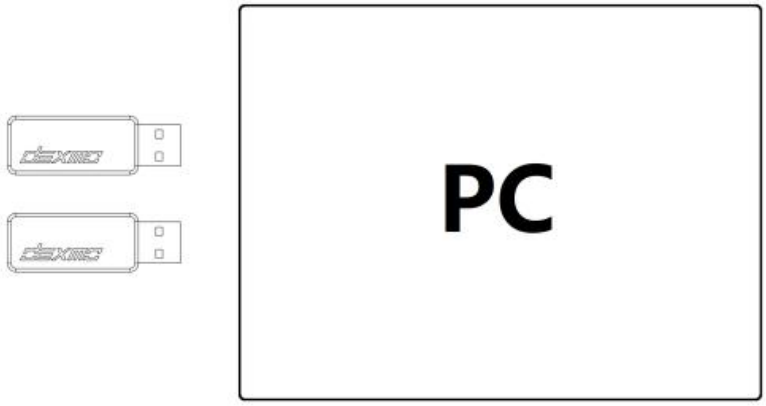
● Make sure both Dexmo are turned off (If not press and hold the Switch Button until Status Indicator light are OFF).

● Plug the power adapter into Dexmo to start charging. (**DO NOT CHARGE WITHOUT POWER ADAPTER**). Status indicator lights will start breathing when charging successfully starts. Status indicator lights will stop breathing and stay OFF when Dexmo is fully charged.

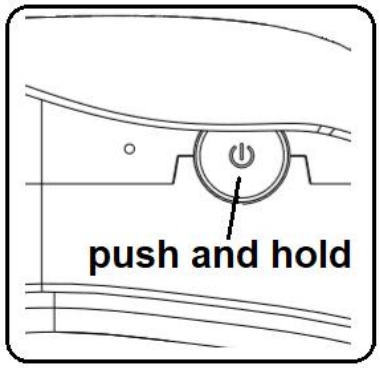
NOTE 1: When battery power is very low, the indicator lights breathing might not start. Do not panic, the charging is still normal, after a short charging period, the breathing will start.
NOTE 2: Although it is possible to use Dexmo during charging, for best performance, it is not recommended to do so.



Step 2: Connecting Dexmo



● Plug both dongles into computer.
NOTE: Please plug-in dongles into **USB 3.0** port
● Turn on both Dexmos, by pressing the Switch Button and hold for a few seconds until the Indicator lights are illuminated.



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

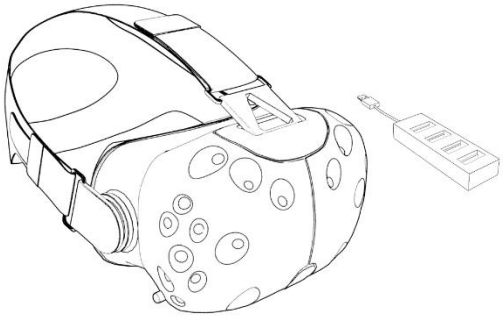
● Dexmo comes with with its own SDK, LibDexmo and a Unity Plugin that enables development on any VR/MR devices that supports Unity Development. E.g. Hololens, Oculus CV1, HTC Vive and PSVR.
**Links to download LibDexmo will be provided after your purchase.*

How to plug both Dongles in HTC Vive Headset (Optional)

If HTC Vive Headset is used, it is recommended to plug both Dongles in the Headset, instead of PC, in order to improve quality of wireless communication.

The 1-to-4 USB 3.0 Hub will be needed here.

1. Get the Headset and 1-to-4 USB Hub ready, then slide and open the USB slot cover on the Headset.



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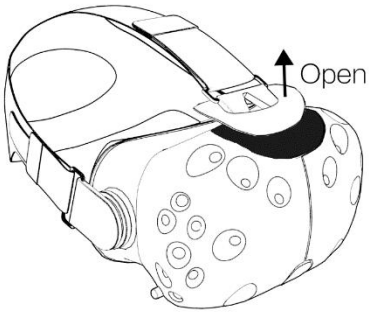

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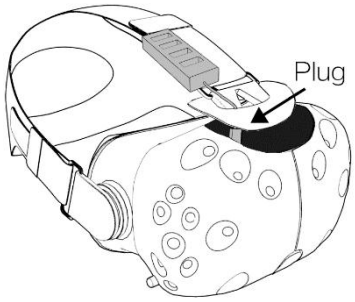
2. Plug the 1-to-4 USB Hub into any free USB slot on the Headset.



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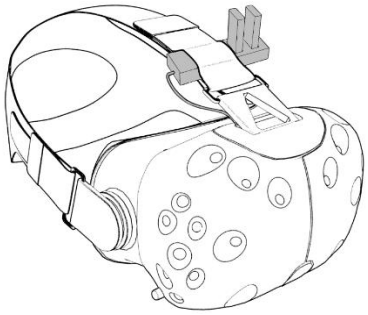
3. Re-install the USB slot cover, fix the 1-to-4 USB Hub on Headset using the elastic band, plug in two Dongles and have fun.



Specifications*

General	
Size	155 × 100 × 45 mm (L × W × D)
Weight	~300 g
Working Temperature	-10°C ~ 40°C
Power	
Battery	LiPo
Battery Capacity	1800 mAh
Battery Life	5 hrs
Charge Time	3 hrs
Power Consumption (Max.)	~50000 mW
Power Consumption (Avg.)	~1000 mW
Adaptor Input	100-240 V (50-60 Hz)
Adaptor Output	5V ⎓ 2A
Motor	
Torque (Max.)	5 kg.cm (0.5 N.m)
Current (Max.)	2 A
Power Consumption (Max.)	10000 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 / Power is fully charged
Lights Off (when switch is ON)	Dexmo is out of power.
Breathing	Dexmo is charging.
Lights Off (during charging, after breathing)	Dexmo is fully charged.

**Specifications described in this section is for one hand only.*