gForce EMG Armband

User Guide

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Menu

1. Trademarks and Copyrights

gForce[TM] is the trademark registered by OYMotion Technologies Co., Ltd.

2. gForce Introduction

The gForce[TM] EMG armband is designed and manufactured by OYMotion. The armband contains 8 highly sensitive EMG sensors with differential dry electrodes, 9-axis IMU motion sensor, and communicates through Bluetooth BLE 4.2. There are 2 variations of the gForce[TM] armband, each with differing kinds of data it can collect ranging from EMG raw data access, gesture training and AI model update, gesture recognition, to IMU raw data and quaternion access (see table below).

3. gForce Models

OYM-GF-P001, OYM-GF-B001, OYM-GFD-001, OYM-GFJ-001

4. gForce Products

Model	Product Name	Features
OYM-GF-P001	gForcePro+ EMG Armband	■Pose Data ■Gesture Recognition ■EMG Raw Data[1] ■Gesture Training[2] ■Color: Orange
OYM-GF-B001	gForce200 Gesture Armband	■Pose Data ■Gesture Recognition ■Color: Black
OYM-GFD-001	gForceDongle BLE to USB Receiver	BLE to USB dongle receiver works on Windows 7 and newer to pair-with and communicate with gForce Armband to get gesture index, EMG raw data, pose data.
OYM-GFJ-001	gForceJoint Adapter	BLE to UART adapter to get gesture index, pose data and forward to such like Arduino MCU system.

Note: 1. Max 1000Hz sample rate, configurable through SDK 2. Work with gForceApp

5. Product Details

5.1 gForce Armband Hardware Components
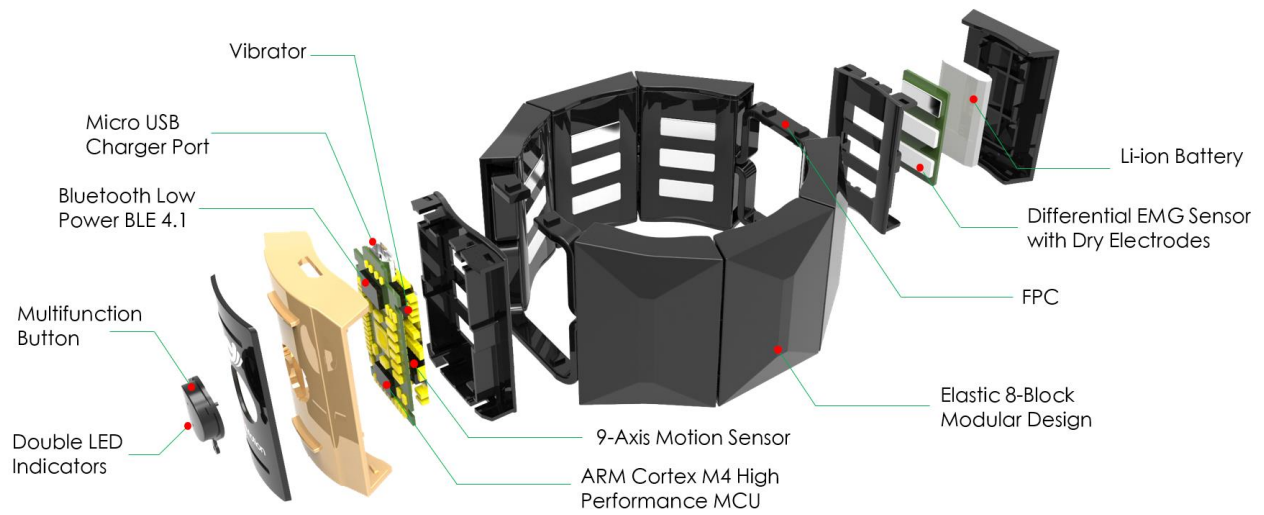
5.2 gForce Armband Size and Weight

Measurement	Value
Inner Diameter	65mm-90mm (max)
Height	40 mm
Thickness	10 mm
Weight	78 g

5.3 gForceDongle BLE to USB Receiver

The gForceDongle is only compatible with Windows 7 or newer. The gForce armband SDK for Windows works with gForceDongle only. The gForceDongle communicates wirelessly through BLE with the gForce armband to send commands to and receive data from gForce.

Measurement	Value
Length	35 mm
Width	20 mm
Thickness	8 mm
Weight	4 g

gForcePro+   gForceDongle   OYM8CHWAVE

OYM8CHWAVE open source project receiving data from gForcePro+ through gForceDongle
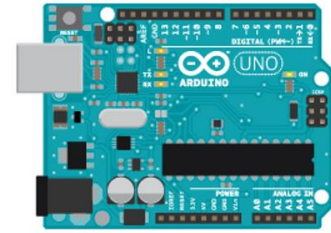
5.4 gForceJoint BLE to UART Adapter

The gForceJoint will pair automatically with any nearby gForce through BLE communication and forward data received from gForce to an UART port on board the gForceJoint. The data collected are gesture indexes recognized from the 8 EMG sensors and quaternion data from the 9-axis IMU sensors. An MCU system such as Arduino can connect with the UART port and receive the gesture indexes and IMU data. **The gForceJoint DOES NOT support EMG raw data forwarding.**

gForce   gForceJoint   Arduino
              (BLE to UART Adapter)

Arduino MCU receives gesture and quaternion data from gForce through gForceJoint BLE to UART adapter

6. System and User Instructions

6.1   OS Platforms Supported by gForce

Platform	Features
  Windows: Win 7 / 8 / 10	• SDK for Windows • Unity3D SDK • gForceDongle BLE to USB Dongle is mandatory
  Android	• Android with BLE 4.2 and up support • Android Unity3D SDK • gForceApp Mobile APP
  Embedded	• SDK for Arduino/Embedded • Arduino/Embedded • gForceJoint BLE to UART Adapter is mandatory

6.2　gForceApp Mobile Application

The gForceApp is a mobile application running on Android. The gForceApp is designed for gForce armband to view gesture results, check pose data, view EMG data, conduct gesture training, have gForce firmware OTA update, and parameter tuning. The gForcePro+ EMG armband supports full features of gesture training, cloud-based AI model generation, and armband model synchronization. With the gForceApp, users can customize their own gestures and then update the gForcePro+ with the newly trained/created gesture. The new gesture model will be saved within the gForcePro+ to replace the old one. Refer to "**gForceApp User Guide**" for more instructional details.
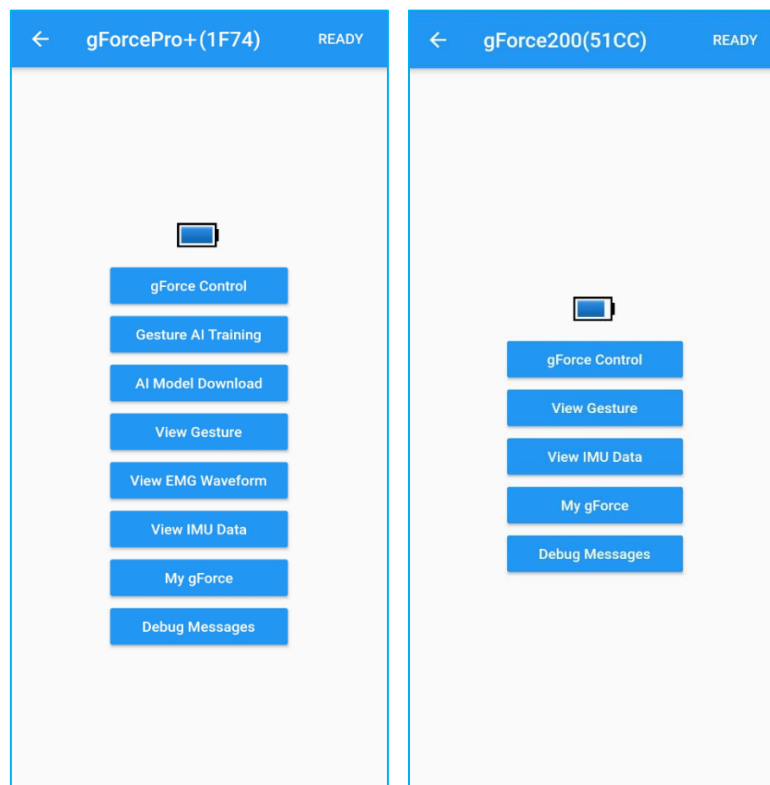
6.3　gForce Armband User Instructions

- The stainless-steel electrodes on the inner side of the gForce should make good contact with the user's skin or else the EMG sensor might not pick up the data properly.
- The wearing position of the armband must remain consistent between gesture training

and gesture recognition.

- The gForce200 comes embedded with a predefined gesture model (6 gestures), it requires user to follow a predefined wearing position. When wearing on the right arm, make sure the USB port points to palm of the hand (refer to image below). When wearing on the left arm, make sure the USB port points toward the inside of the elbow.
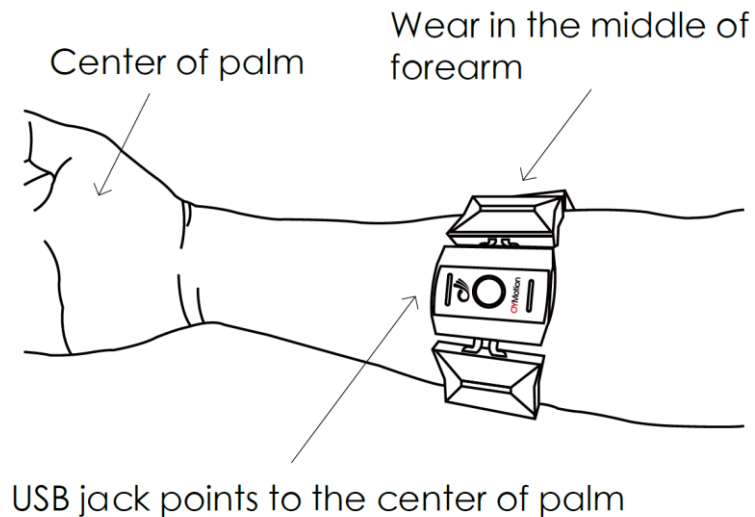
Example of gForce200 on user's right arm
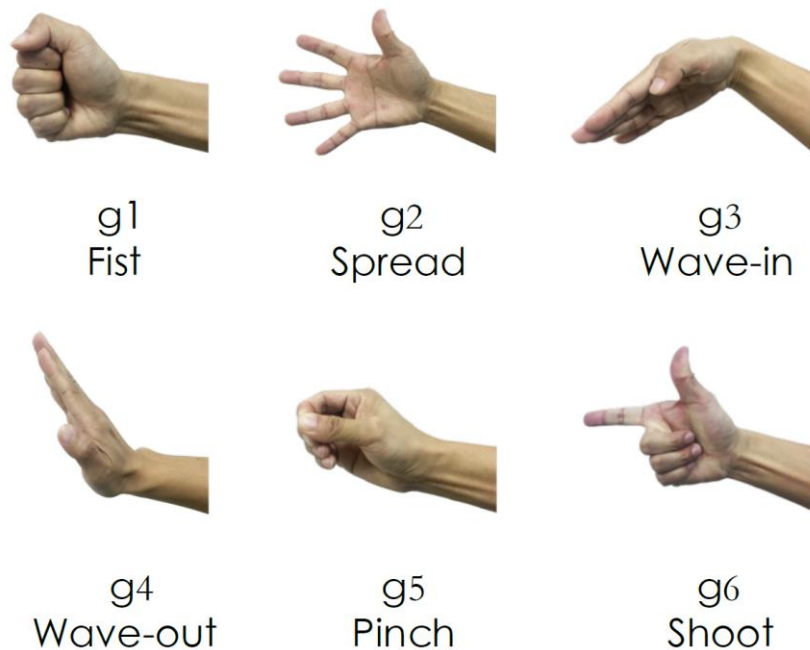
Predefined 6 gestures of gForce200

- **Powering on**: To turn on, press and hold the power button on gForce until the green LED is on then release the button. The gForce will vibrate and the green LED will flash at a 1Hz frequency, this means that the armband is looking for a BLE connection. When gForce is connected thru BLE, the green LED will stop flashing and remain on. If the green LED flashes at a 2.5Hz frequency it, means there is data transaction.

- **Firmware update mode**: Press and hold the power button on gForce for 10 seconds to activate firmware update mode. This should **only** be used when the armband is **not** working properly. User can then update the firmware through the gForceApp. gForce can return to normal mode by powering off and powering on again.

- **Powering off:** To turn off, press and hold the power button for 5 seconds. Afterwards, the green LED will turn off indicating power off (if the internal IMU's auto calibration is successful, the green LED will flash three times first otherwise it will just turn off).

- **Charging**: When charging a red LED will be on until the armband finishes charging after which the led will turn off.

7. gForce EMG Armband Parameters

Features	Value
Communication	• BLE4.2 Standard
Distance	• 10 Meters
Power Consumption	• 0.1W
Battery	• 200mAh/3.7V Li-ion
Power Input	• USB 5V
Color	• gForce200:　Black • gForcePro+:　Orange

Gestures	• gForce200： 6 Predefined Gestures • gForcePro+： Up to 16 user customizable gestures （gestures must have noticeable EMG differences)
EMG Raw Data (gForcePro+ only)	• Realtime EMG raw data access supported • Sample rate： max 1000Hz • ADC： 8bit (max 1000Hz sample rate) 12bit (max 500Hz sample rate) • Channels: 8 • Gain: 1200 • Filter: 20-500Hz hardware band pass filter
IMU Raw Data	• 9-axis IMU motion sensors • Sample rate: 50Hz • ACC, GYRO, MAG raw data access
Pose Data	• Quaternion access • Euler access • Rotation Matrix access • Sample Rate: 50Hz

Software Support	• SDK For Windows
	• SDK For Android
	• SDK For Arduino/Embedded
	• Unity3D SDK for Windows/Android
	• Open Source oym8chwave Project to Capture EMG Raw Data, IMU, etc
	• gForceApp Mobile APP

8. gForceDongle Parameters

Item	Parameter
Radio Frequency	BLE 2402-2480MHZ
Power Input	USB 5V
Radio Power	4dBm
Antenna Type	Ceramic
Antenna Gain	-0.5dBi

9. Packaging Item List

9.1 gForcePro+ EMG Armband

Items	Quantity
gForcePro+ EMG Armband (Orange)	1
gForceDongle BLE to USB Dongle	1
USB Cable	1

9.2 gForce200 Gesture Armband

Items	Quantity
gForce200 Gesture Armband (Black)	1
gForceJoint BLE to UART Adapter	1
USB Cable	1

10. Tech Support

10.1 gForceSDK For Windows

gForceSDK C++ for Windows contains the gForce SDK lib, header files, readme and sample projects for developers to start with Windows platform.

Download: https://github.com/oymotion/gForceSDKCXX
OYM8CHWAVE open source sample project to start with:
https://oymotion.github.io/APPs/oym8CHWave/

10.2 gForceSDK For Android

gForceSDK for Android contains the gForce SDK lib, header files, readme and sample projects for developers to start with Android platform.

Download: https://github.com/oymotion/gForceSDKAndroidDemo

10.3 gForceSDK For Arduino/Embedded

gForceSDK for Arduino contains the gForce SDK C source code, header files (**Quaternion and Gesture indexes only, no EMG or IMU raw data access**), sample project for Arduino. This SDK C source code interfaces with gForceJoint through UART and to parse the Quaternion and Gesture indexes received. Developers can port the same logic to other embedded system.
gForceSDK for Arduino works with gForceJoint only.

Download: https://github.com/oymotion/gForceSDKArduino

10.4 gForceSDK for Unity3D

gForceSDK for Unity3D contains the gForce SDK lib, header files, sample U3D projects. It supports both Windows and Android.

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Download：https://github.com/oymotion/gForceSDKUnity.git

10.5 SDK Manual

Before developers start coding own projects, DO spend time going thru the SDKs manual:

https://oymotion.github.io/gForceSDK/gForceSDK/

We have outlined most of the important information at:

https://oymotion.github.io/

11. Contact US

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