

Go Direct[®] Hand Dynamometer

(Order Code GDX-HD)



Go Direct Hand Dynamometer can be used to measure grip and pinch strength and to perform muscle fatigue studies. This sensor connects directly to student devices via Bluetooth[®] wireless technology or USB. Students can correlate muscle strength and fatigue when they pair Go Direct Hand Dynamometer and Go Direct EKG.

Go Direct Hand Dynamometer can be used in a variety of experiments:

- Observe the effect of a conscious effort to overcome fatigue on hand grip strength.
- Correlate grip strength with arm circumference or height.
- Correlate measurements of grip strength and electrical activity with muscle fatigue.
- Evaluate grip strength and different limb positions.

Note: Vernier products are designed for educational use. Our products are not designed nor are they recommended for any industrial, medical, or commercial process such as life support, patient diagnosis, control of a manufacturing process, or industrial testing of any kind.

What's Included

- Go Direct Hand Dynamometer
- Micro USB Cable

Compatible Software

See www.vernier.com/manuals/gdx-hd for a list of software compatible with Go Direct Hand Dynamometer.

Getting Started

Please see the following link for platform-specific connection information:

www.vernier.com/start/gdx-hd

Bluetooth Connection

1. Install Vernier Graphical Analysis[™] on your computer, Chromebook[™], or mobile device. If using LabQuest[®], make sure LabQuest App is up to date. See www.vernier.com/ga4 for Graphical Analysis availability or www.vernier.com/downloads to update LabQuest App.
2. Charge your sensor for at least

USB Connection

1. If using a computer or Chromebook, install Vernier Graphical Analysis. If using LabQuest, make sure LabQuest App is up to date. See www.vernier.com/ga4 for Graphical Analysis availability or www.vernier.com/downloads to update LabQuest App.
2. Connect the sensor to the USB

3. Turn on your sensor by pressing the power button once. The Bluetooth[®] LED will blink red.
4. Launch Graphical Analysis or turn on LabQuest. You are now ready to collect data.
5. If using Graphical Analysis, click or tap Sensor Data Collection. If using LabQuest, choose Wireless Device Setup > Go Direct from the Sensors menu.
6. Select your Go Direct sensor from the list of Discovered Wireless Devices. Your sensor's ID is located near the barcode on the sensor. The Bluetooth LED will blink green when it is successfully connected.
7. Click or tap Done. You are now ready to collect data.
8. This is a multi-channel sensor. To change the channel selections, see www.vernier.com/start/gdx-hd

Note: This sensor does not work with the original LabQuest. It works with LabQuest 2 or LabQuest 3.

Charging the Sensor

Connect Go Direct Hand Dynamometer to the included USB Charging Cable and any USB device for two hours.

You can also charge up to eight Go Direct Hand Dynamometer Sensors using our Go Direct Charge Station, sold separately (order code: GDX-CRG). An LED on each Go Direct Hand Dynamometer indicates charging status.

Charging	Orange LED next to the battery icon is solid while the sensor is charging.
Fully charged	Green LED next to the battery icon is solid when the sensor is fully charged.

Powering the Sensor

Turning on the sensor	Press button once. Red LED indicator next to the Bluetooth icon flashes when the unit is on.
Putting the sensor in sleep mode	Press and hold button for more than three seconds to put into sleep mode. Red LED indicator next to Bluetooth icon stops flashing when sleeping.

Connecting the Sensor

See the following link for up-to-date connection information:

www.vernier.com/start/gdx-hd

Connecting via Bluetooth Wireless Technology

Ready to connect	Red LED next to the Bluetooth icon flashes when sensor is awake and ready to connect.
Connected	Green LED next to the Bluetooth icon flashes when sensor is connected via Bluetooth wireless technology.

Connecting via USB

Connected and charging	Orange LED next to the battery icon is solid when the sensor is connected to Graphical Analysis via USB and the unit is charging. LED next to Bluetooth icon is off.
Connected, fully charged	Green LED next to the battery icon is solid when the sensor is connected to Graphical Analysis via USB and fully charged. LED next to Bluetooth icon is off.
Charging via USB, connected via Bluetooth	Orange LED next to battery icon is solid when sensor is connected to charger via USB and the unit is charging. Green LED next to Bluetooth icon flashes when sensor is connected via Bluetooth wireless technology.

Identifying the Sensor

When two or more sensors are connected, the sensors can be identified by tapping or clicking Identify in Sensor Information.

Using the Product

Connect the sensor following the steps in the Getting Started section of this user manual.

- To assess grip strength, hold the sensor in a vertical position so that the fingers and palm of the hand make contact with the sensor pads. Squeeze the sensor so that force is applied to the pads.
- To assess pinch strength, hold the sensor in one hand by the case avoiding contact with the pads. Using your thumb and forefinger of the opposite hand, place each on the opposing pinch pads and squeeze.
- If the default experiment duration is too long for your experiment, change the data-collection parameters in the program you are using.

Channels

Go Direct Hand Dynamometer has seven measurement channels. The channel names are

- Force
- X-axis acceleration
- Y-axis acceleration
- Z-axis acceleration
- X-axis gyro
- Y-axis gyro
- Z-axis gyro

Force

The default channel that is active when the sensor is connected is Force. The force channel measures force applied to the hand or finger grips along the body of the sensor.

Acceleration

There are three acceleration channels, measured by a single chip. An icon on the sensor shows the positive direction for each axis. Each direction of acceleration can be measured separately.

If you choose to activate all three acceleration channels at once, you can create a calculated column for the total acceleration magnitude.

Gyroscope

Use the gyroscope channels to measure the rotation rate of the unit. If you choose to activate all three gyroscope channels at once, you can create a calculated column for the total magnitude of angular velocity.

Calibrating the Sensor

You should not have to perform a new calibration when using Go Direct Hand Dynamometer. We have set the sensor to match our stored calibration before shipping it. You can simply use the appropriate calibration value that is stored in the data-collection program.

Zeroing the Sensor

If the sensor does not read zero in the orientation in which you are using it, follow the standard zeroing procedure for the data-collection program you are using. For additional information, see www.vernier.com/til/4311

Specifications

Maximum sampling rate	10 samples/s
Resolution	0.1 N
Safety range (maximum force without damage to the sensor)	0 to 850 N
Operational range	0 to 600 N
USB specification	2.0
Wireless specification	Bluetooth 4.2
Maximum wireless range	30 m (unobstructed)
Battery	300 mA Li-Poly Rechargeable

Care and Maintenance

Battery Information

The Go Direct Hand Dynamometer contains a small lithium-ion battery. The system is designed to consume very little power and not put heavy demands on the battery. Although the battery is warranted for one year, the expected battery life should be several years. Replacement batteries are available from Vernier (order code: GDX-BAT-300).

Storage and Maintenance

To store the Go Direct Hand Dynamometer for extended periods of time, put the device in sleep mode by holding the button down for at least three seconds. The red LED will stop flashing to show that the unit is in sleep mode. Over several months, the battery will discharge but will not be damaged. After such storage, charge the device for a few hours, and the unit will be ready to go.

Exposing the battery to temperatures over 35°C (95°F) will reduce its lifespan. If possible, store the device in an area that is not exposed to temperature extremes.

Water Resistance

Important: Go Direct Hand Dynamometer is not water resistant and should never be immersed in water.

If water gets into the device, immediately power the unit down (press and hold the power button for more than three seconds). Disconnect the sensor and charging cable, and remove the battery. Allow the device to dry thoroughly before attempting to use the device again. Do not attempt to dry using an external heat source.

How the Sensor Works

Go Direct Hand Dynamometer is a strain-gauge based isometric force sensor. This sensor amplifies the force applied converting it into a digital signal. Go Direct Hand Dynamometer reports values in newtons (N), pounds (lb), or kilograms (kg).

Troubleshooting

Connect the sensor to the Graphical Analysis 4 app and try the following:

- If the sensor does not read zero in the orientation in which you are using it, follow the standard zeroing procedure for the data-collection program you are using.

For additional troubleshooting and FAQs, including the standard zeroing procedure, see www.vernier.com/til/4311

Repair Information

If you have watched the related product video(s), followed the troubleshooting steps, and are still having trouble with your Go Direct Hand Dynamometer, contact Vernier Technical Support at support@vernier.com or call 888-837-6437. Support specialists will work with you to determine if the unit needs to be sent in for repair. At that time, a Return Merchandise Authorization (RMA) number will be issued and instructions will be communicated on how to return the unit for repair.

Accessories/Replacements

Item	Order Code
Micro USB Cable	CB-USB-MICRO
USB-C to Micro USB Cable	CB-USB-C-MICRO
Go Direct 300 mAh Replacement Battery	GDX-BAT-300

Warranty

Warranty information for this product can be found on the Support tab at www.vernier.com/gdx-hd

General warranty information can be found at www.vernier.com/warranty

Disposal

When disposing of this electronic product, do not treat it as household waste. Its disposal is subject to regulations that vary by country and region. This item should be given to an applicable collection point for the recycling of electrical and electronic equipment. By ensuring that this product is disposed of correctly, you help prevent potential negative consequences on human health or on the environment. The recycling of materials will help to conserve natural resources. For more detailed information about recycling this product, contact your local city office or your disposal service.

Battery recycling information is available at www.call2recycle.org

Do not puncture or expose the battery to excessive heat or flame.



The symbol, shown here, indicates that this product must not be disposed of in a standard waste container.

Federal Communication Commission Interference Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

FCC Caution

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- (1) this device may not cause harmful interference and
- (2) this device must accept any interference received, including interference that may cause undesired operation

RF Exposure Warning

The equipment complies with RF exposure limits set forth for an uncontrolled environment. The antenna(s) used for this transmitter must not be co-located or operating in conjunction with any other antenna or transmitter. You are cautioned that changes or modifications not expressly approved by the party responsible for compliance could void your authority to operate the equipment.

IC Statement

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions:

- (1) this device may not cause interference, and
- (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Industry Canada - Class B This digital apparatus does not exceed the Class B limits for radio noise emissions from digital apparatus as set out in the interference-causing equipment standard entitled "Digital Apparatus," ICES-003 of Industry Canada. Operation is subject to the following two conditions: (1) this device may not cause interference, and

- (2) this device must accept any interference, including interference that may cause undesired operation of the device.

To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that permitted for successful communication.

RF exposure warning: The equipment complies with RF exposure limits set forth for an uncontrolled environment. The antenna(s) used for this transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :

- (1) l'appareil ne doit pas produire de brouillage, et
- (2) l'appareil doit accepter toute interférence radioélectrique, même si cela résulte à un brouillage susceptible d'en compromettre le fonctionnement.

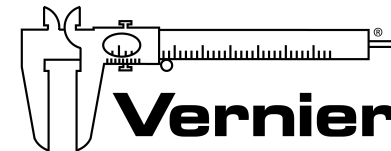
Cet appareil numérique respecte les limites de bruits radioélectriques applicables aux appareils numériques de Classe B prescrites dans la norme sur le matériel interférent-brouilleur: "Appareils Numériques," NMB-003 édictée par Industrie Canada. L'utilisation est soumise aux deux conditions suivantes:

- (1) cet appareil ne peut causer d'interférences, et
- (2) cet appareil doit accepter toutes interférences, y comprises celles susceptibles de provoquer un dysfonctionnement du dispositif.

Afin de réduire les interférences radio potentielles pour les autres utilisateurs, le type d'antenne et son gain doivent être choisis de telle façon que l'équivalent de puissance isotrope émis (e.i.r.p.) n'est pas plus grand que celui permis pour une communication établie.

Avertissement d'exposition RF: L'équipement est conforme aux limites d'exposition aux RF établies pour un environnement non supervisé. L'antenne (s) utilisée pour ce transmetteur ne doit pas être jumelée ou fonctionner en conjonction avec toute autre antenne ou transmetteur.

Note: This product is a sensitive measurement device. For best results, use the cables that were provided. Keep the device away from electromagnetic noise sources, such as microwaves, monitors, electric motors, and appliances.



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