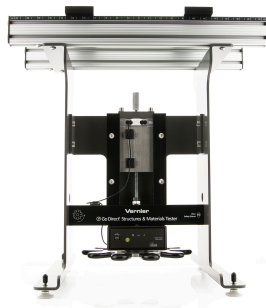


# Go Direct<sup>®</sup> Structures & Materials Tester

(Order Code GDX-VSMT)



Test bridges, structures, and beams as part of an engineering design activity with Go Direct Structures & Materials Tester. Use the Structures & Materials Tester, along with the engineering design process, to design, build, and test structures, conduct bridge competitions, and investigate and analyze beam designs and properties of materials.

The Structures & Materials Tester is equipped with a force sensor (rated to 1000 N) and an encoder to measure displacement (1  $\mu\text{m}$  resolution). Using both sensors, you can record maximum loads, as well as load versus displacement characteristics, so students can evaluate deflection, stress, and strain.

The crossbars of the Tester are designed to easily slide and secure into position. With rulers located on the Tester, you can accurately position the support beams for center or off-center loading.

The Tester is equipped with a well-outfitted VSMT Tackle Kit. The Kit provides a variety of means to quickly and easily connect the load cell to materials, beams, and structures for testing. The VSMT Tackle Kit is also sold as an accessory kit (order code VSMT-TK). A second Kit may be useful in cases where large numbers of structures are being tested in a short period of time, such as during bridge competitions.

**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

- The testing device with force and displacement sensors
- Micro USB Cable
- Allen wrench
- A VSMT Tackle Kit with hardware to connect bridges, structures, and materials to the tester. This includes
  - 50 × 50 mm × 6 mm aluminum load plate
  - 50 × 80 mm × 6 mm aluminum load plate
  - 12-inch threaded rod
  - 8-inch threaded rod
  - 6.5 inches of chain
  - Small U-bolt
  - Large U-bolt
  - Eyebolts (2)

- Coupling nut
- Quick links (2)

## Compatible Software

See [www.vernier.com/manuals/gdx-vsmt](http://www.vernier.com/manuals/gdx-vsmt) for a list of software compatible with the Go Direct Structures & Materials Tester.

## Assembly

Refer to the Go Direct Structures & Materials Tester Assembly Instructions that are shipped with the product. These are also available online at [www.vernier.com/gdx-vsmt-assembly](http://www.vernier.com/gdx-vsmt-assembly)

## Getting Started

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

[www.vernier.com/start/gdx-vsmt](http://www.vernier.com/start/gdx-vsmt)

## Bluetooth Connection

1. Install Graphical Analysis™ 4 on your computer, mobile device, or Chromebook™. See [www.vernier.com/ga4](http://www.vernier.com/ga4) for software availability.
2. Charge your Go Direct Structures & Materials Tester for at least 8 hours before first use.
3. Turn on your Go Direct Structures & Materials Tester by pressing the power button once. The Bluetooth® LED will blink red.
4. Launch Graphical Analysis 4.
5. Click or tap Sensor Data Collection.
6. Click or tap your Go Direct Structures & Materials Tester 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. The active channel is listed in the Connected Devices Sensor Channels list. To change channels, select the check box next to the Sensor Channel(s) you would like to activate.
8. Click or tap Done to enter data-collection mode.

## Charging the Structures & Materials Tester Battery

Connect the Go Direct Structures & Materials Tester to the included Micro USB Cable and any USB device for eight hours.

You can also charge Go Direct Structures & Materials Tester using our Go Direct Charge Station, sold separately (order code: GDX-CRG).

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

## Connecting the Sensor

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

[www.vernier.com/start/gdx-vsmt](http://www.vernier.com/start/gdx-vsmt)

### Connecting via Bluetooth

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

### Connecting via USB

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

## Identifying the Sensor

You can make the Bluetooth LED flash red and green by clicking Identify in Sensor Information. This is useful to distinguish between two identical sensors.

## Using the Product

Connecting your structure/material to be tested securely to the device is critical to the safe and proper use of Go Direct Structures & Materials Tester (GDX-VSMT). The VSMT Tackle Kit comes with a variety of components that are used to secure the structure/material to the Tester cross bars and connect to the GDX-VSMT force sensor. All structures and materials are generally supported by the crossbars that can be adjusted from 0 cm to over 40 cm. The bars can be secured in place by tightening the hex head screws.

The primary methods of attaching the tackle to the structure/material are to use a U-bolt in combination with quick links (and chain, as needed), or by using a threaded rod and load plate.

Once the structure or beam is secured in place with the appropriate tackle, launch Graphical Analysis 4 and connect the Go Direct Structures & Materials

Tester as described in the Getting Started section. Turn the displacement wheel counter clockwise and the force sensor travels down, applying a force to the structure or beam via the tackle. The GDX-VSMT force sensor registers the force while the GDX-VSMT displacement sensor tracks how far the structure has been deflected, bent, or stretched.

### Zeroing the Sensors

Zero both of the sensors before any data collection. The VSMT displacement and force sensors should be zeroed with the tackle just in contact with the structure or beam immediately before applying a force.

If a structure is attached to the GDX-VSMT force sensor by means of a rigid connection (e.g., a threaded rod), the tackle is supported by the force sensor. Zero the force sensor with the tackle attached so that the sensor will register only the force actually applied to the structure.

If a structure is attached to the GDX-VSMT force sensor by means of a non-rigid connection (e.g., U-bolt, quick link and chain) then the weight of the tackle is an additional force that is applied to the structure. If necessary for your investigation you can account for the weight of the tackle by adding a new calculated column.

### Force Sensor Overload Warning

If the force applied to the force sensor exceeds its rated load of 1,000 N (225 lbs) a red light will appear on the face of the sensor electronics box. This is the indication that no additional force should be applied in order to avoid damaging the sensor.

## Specifications

Range	Force 0–1000 N Displacement ~ 0–7 cm
Resolution	Force 0.1 N Displacement 1 $\mu$ m
Battery	300 mAh Li-Poly Rechargeable
Battery life (single full charge)	~10 hours continuous data collection
Battery life (long term)	~300 full charge cycles (several years depending on usage)

## Safety

Go Direct Structures & Materials Tester is capable of storing energy as it applies force to structures being tested. When structures fail under stress they can release that energy very quickly. Vernier recommends the use of safety glasses when using the VSMT to protect eyes from flying debris.

It is also important to connect the tackle securely. Threaded parts should be attached so that a sufficient amount of the threaded component is engaged. For example, the threaded rod should extend through the load plate so that its end is at least flush with the upper surface. Quick links should be secured and not left open.

## Care and Maintenance

### Battery Information

The Go Direct Structures & Materials Tester 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-650).

### Storage and Maintenance

To store the Go Direct Structures & Materials Tester 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

The Go Direct Structures & Materials Tester 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 Sensors Work

Go Direct Structures & Materials Tester (GDX-VSMT) uses a reflective optical encoder to measure rotation of the wheel which is translated into deflection. The encoder disc is mounted on the threaded rod and has 794 reflective and non-reflective sectors. The encoder produces two pulse output patterns 90° apart in phase. The movement of the threaded rod is determined by counting the pulses. The phase relationship between the output signals determines the direction of rotation.

Go Direct Structures & Materials Tester uses this count to determine the revolutions of the wheel (or fractions, thereof). The GDX-VSMT displacement and force sensors are linked by a threaded rod with a pitch of 16 (16 threads per inch).

The force sensor uses strain gauge technology to measure a change in resistance with a change in force applied to the sensor.

## Troubleshooting

For troubleshooting and FAQs, see [www.vernier.com/til/4505](http://www.vernier.com/til/4505)

## Repair Information

If you have followed the troubleshooting steps and are still having trouble with your Go Direct Structures & Materials Tester, contact Vernier Technical Support at [support@vernier.com](mailto:support@vernier.com) or call 888-837-6437.

## Accessories/Replacements

Item	Order Code
VSMT Tackle Kit	VSMT-TK
Replacement Battery	GDX-BAT-650
Micro USB Cable	CB-USB-MICRO
USB-C to Micro USB Cable	CB-USB-C-MICRO

### Go Direct Bridge Competition Software

Go Direct Bridge Competition Software is a free standalone application for Windows® computers used for bridge (or other structure) competitions conducted with Go Direct Structures & Materials Tester. The software provides a visual representation of the force acting on the structure, as well as a comparison to previously tested structures.

## Warranty

Vernier warrants this product to be free from defects in materials and workmanship for a period of five years from the date of shipment to the customer. This warranty does not cover damage to the product caused by abuse or improper use. This warranty covers educational institutions only.

## 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](http://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.

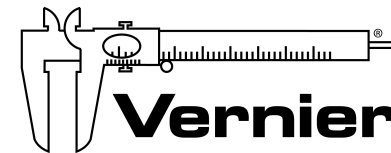
Cet appareil numérique respecte les limites de bruits radioélectriques applicables aux appareils numériques de Classe B prescrites dans la norme sur le matériel interférant-brouilleur: "Appareils Numériques," NMB-003 édictée par industrie Canada. L'utilisation est soumise aux deux conditions suivantes:

- (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 émise (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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