

Vernier Go Direct® Materials Test Frame

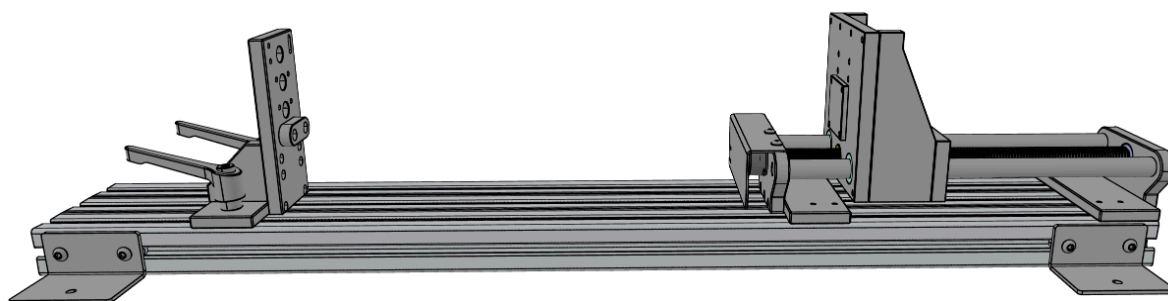
order code: GDX-MTF

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1. [Assembly Directions: Materials Test Frame](#)
2. [Conduct a Compression Test: Determine the Spring Constant](#)
3. [Set Up for a Tension Test](#)

What's Included with the Materials Test Frame?

Materials Test Frame



Additional Parts

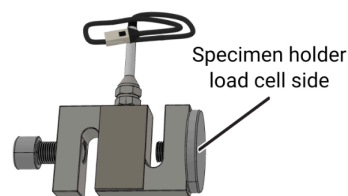
Electronics box
bracket and screws



Electronics box



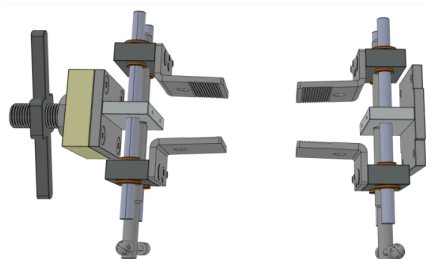
Load cell



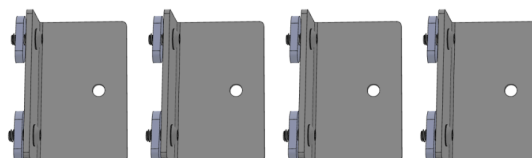
Tension grips

Load cell side

Actuator plate side



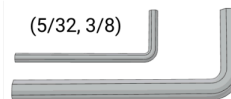
Stabilizing feet



Spring



Hex keys
(5/32, 3/8)



Fixture bolts
(extra)



Actuator handle



For the user manual, visit www.vernier.com/manuals/gdx-mtf

For troubleshooting and FAQs, visit www.vernier.com/til/27011

Note: Vernier products are for educational use only.

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 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.

Vernier Science Education

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Rev. 9/01/2026

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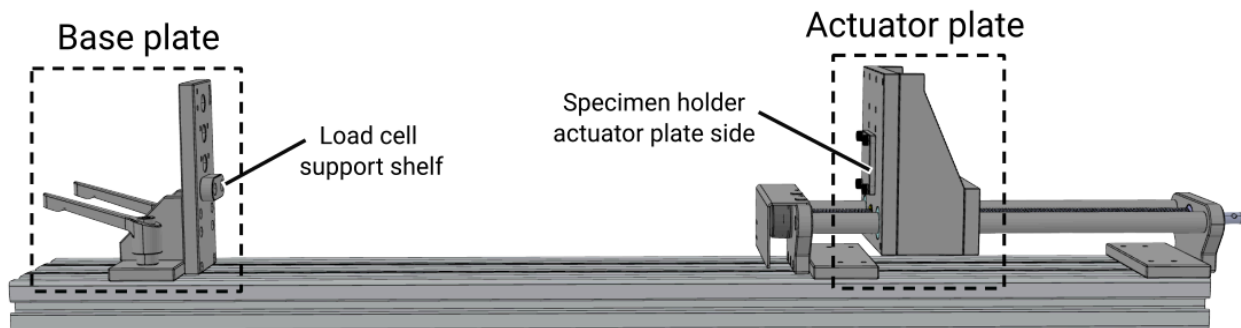
Assembly Directions: Materials Test Frame

Materials

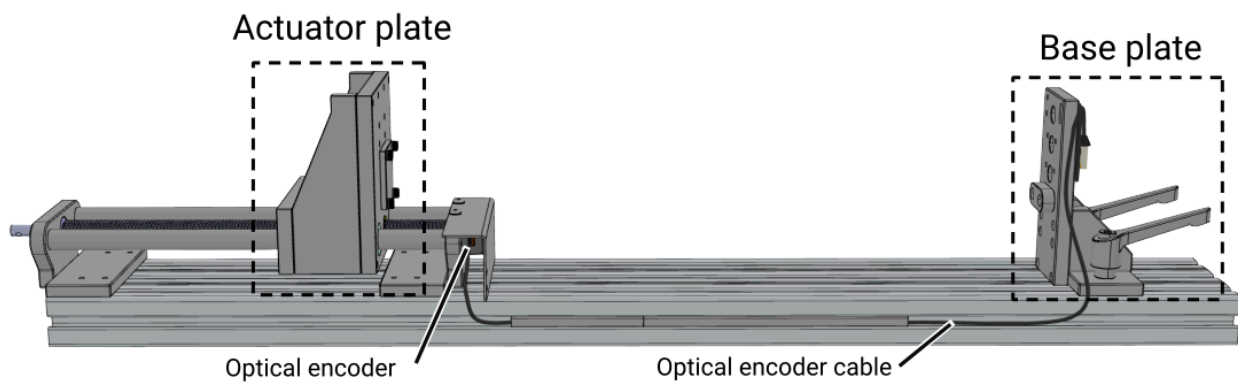
- ☐ Materials Test Frame
- ☐ load cell
- ☐ electronics box
- ☐ electronics box bracket and (2) screws
- ☐ (2) hex keys: 5/32" and 3/8"
- ☐ (4) stabilizing feet
- ☐ actuator handle
- ☐ (not included) Phillips head screwdriver

Materials Test Frame Parts

Front



Back



1 Attach the load cell

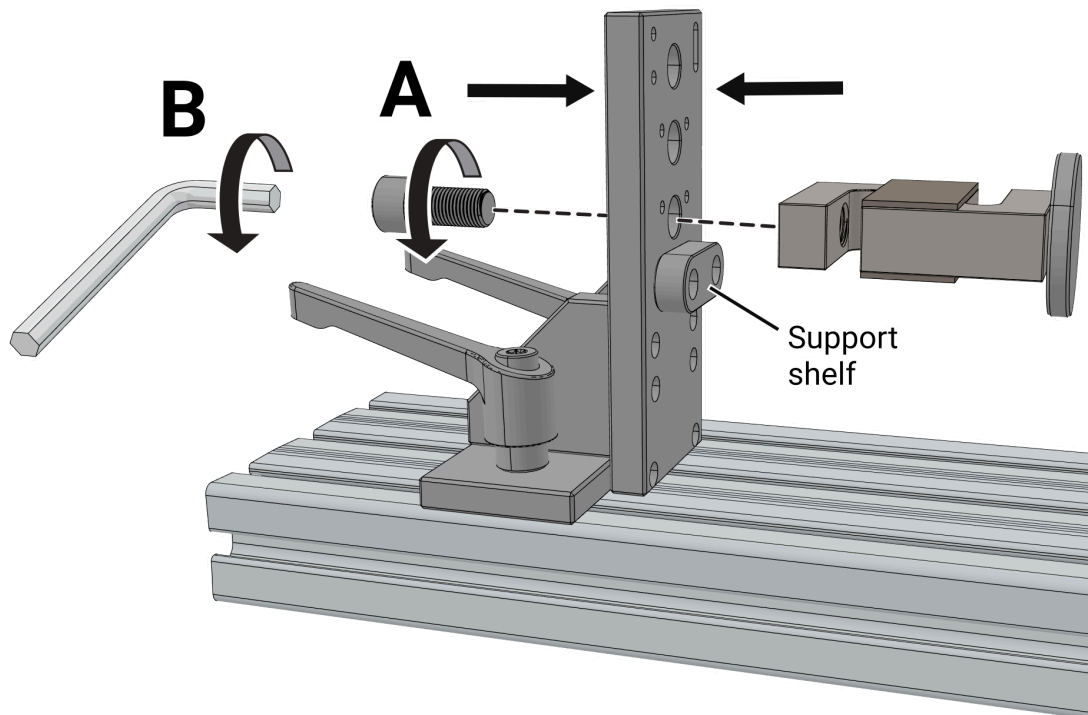
The load cell connects to the base plate. There are three holes in the base plate. For now you will connect to the lowest position.

When testing your own samples, you can change the position of the load cell so it is at the ideal height for the test material. Larger diameter samples may require the load cell to be in the middle or upper position.

Note: The **moveable support shelf on the base plate** is pre-installed to support the load cell in the lowest position. If you move the load cell to the middle or upper position, use the smaller hex key to move the support shelf.

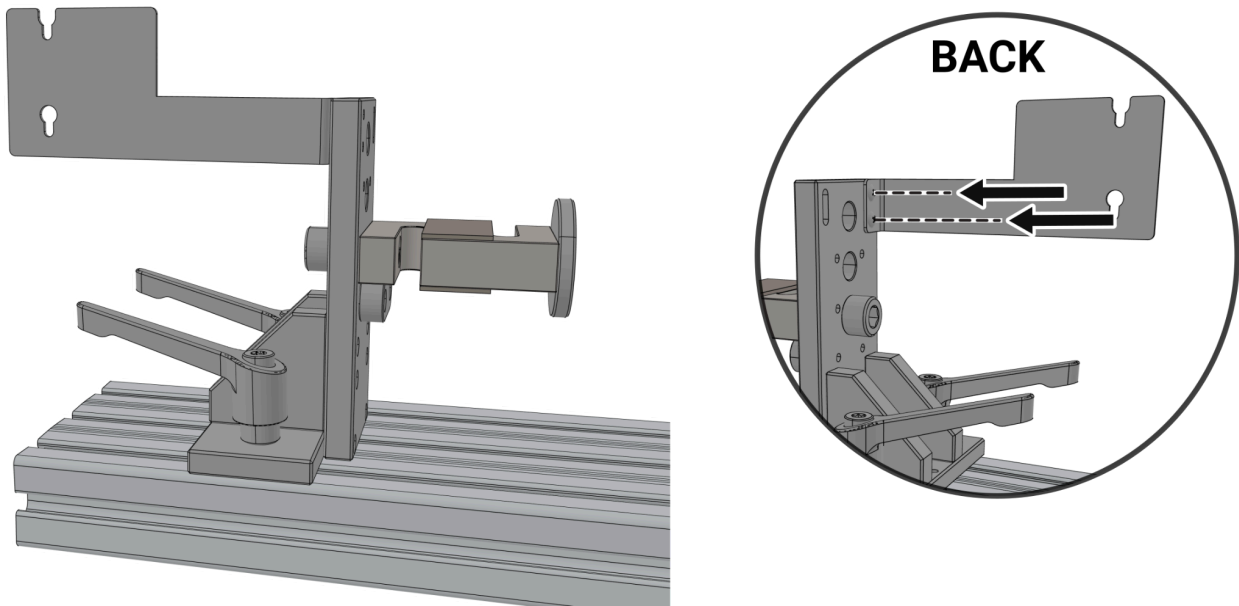
To attach the load cell

- A. Rest the load cell on top of the support shelf and hand tighten the bolt.
- B. Use the larger, 3/8" hex key to tighten the bolt.



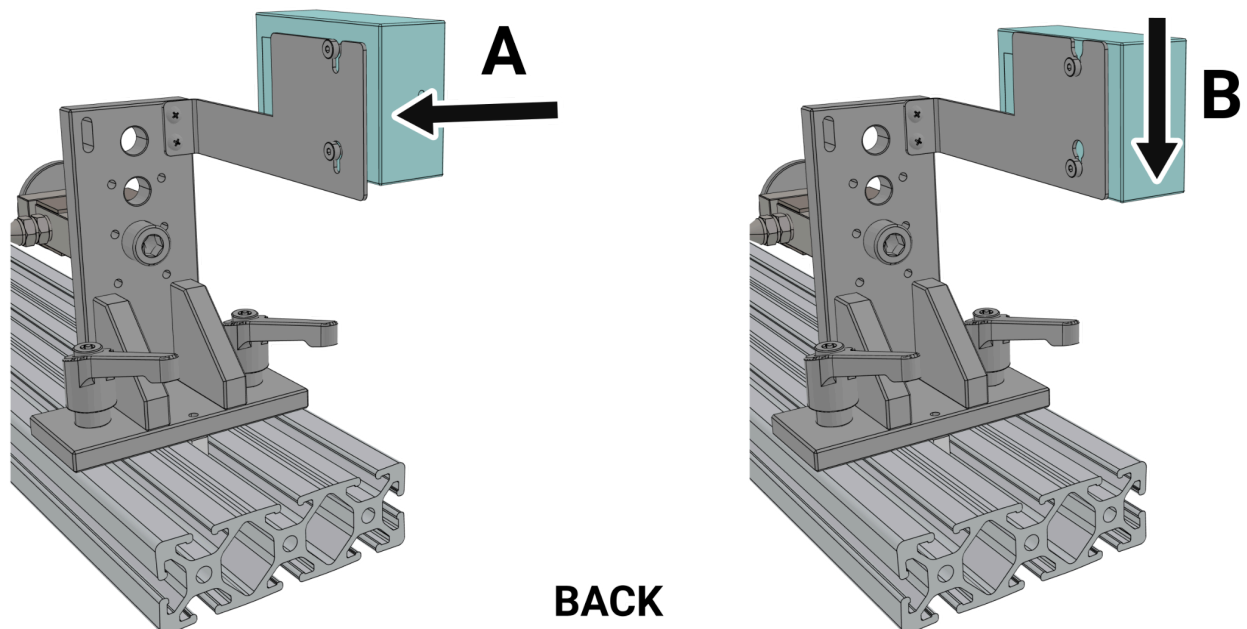
2 Attach the electronics box bracket

Use a **Phillips head screwdriver (not included)**. First remove the 2 screws from the upper corner of the base plate. Then connect the electronics bracket.

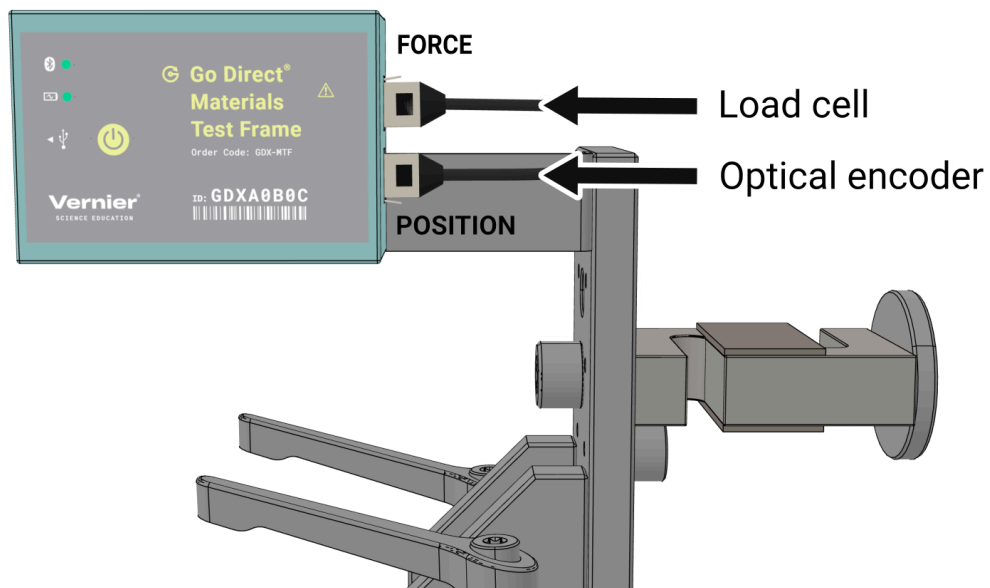


3 Attach the electronics box to the bracket

- A. Line up bolts on the back of the electronics box with the cutouts in the bracket.
- B. Lower the box so it rests at the bottom of the cutouts.



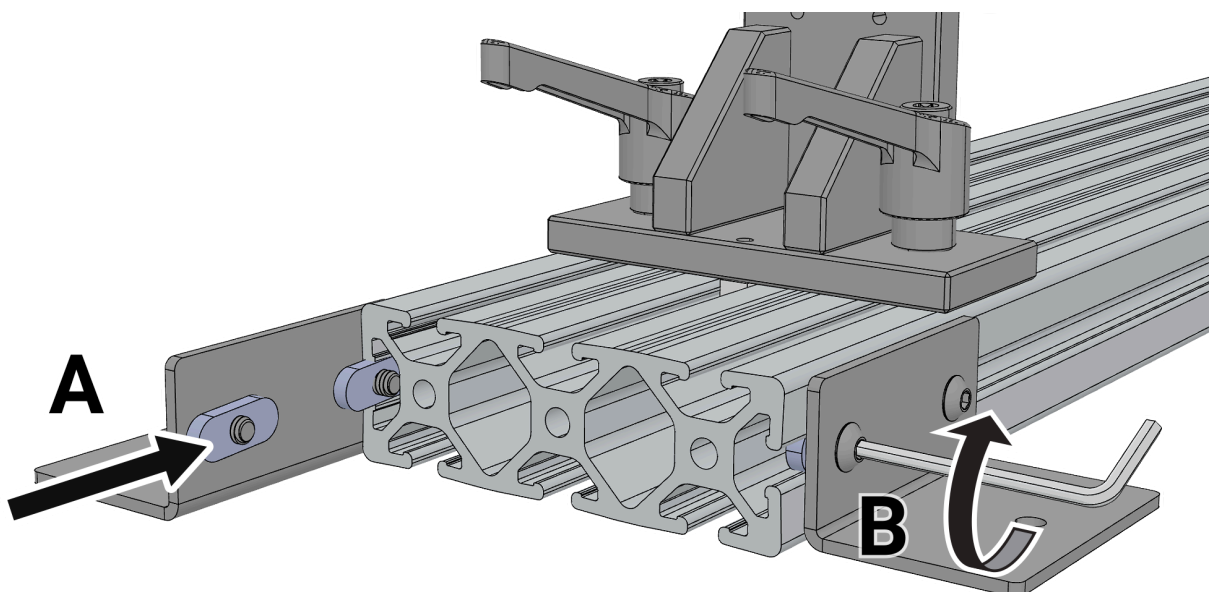
4 Connect sensor cables to the electronics box



5 Secure cables

Use the velcro to secure the cables to the base plate.

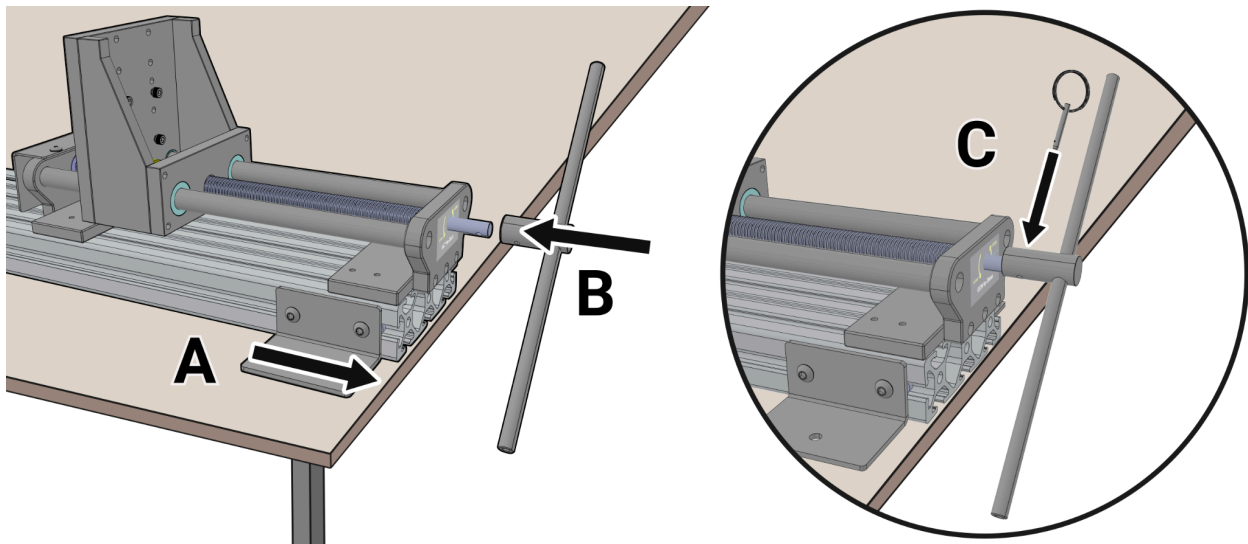
6 Connect the stabilizing feet (4)



7 Connect the actuator handle

This handle is used to apply tension or compression to the sample.

- A. Move the test frame so the actuator plate end of the track is at the edge of the table or desk.
- B. Slide the handle onto the pin at the end of the test frame.
- C. Insert the cotter pin to hold the handle in place.



You have now completed the assembly steps. Continue on to conduct a compression test with the validation spring to determine the spring constant.

Conduct a Compression Test: Determine the Spring Constant

Your first “out of the box” test of the Materials Test Frame should be to determine the spring constant of the included spring.

The spring is used as a validation tool to indicate if the Materials Test Frame is providing consistent values over time. For more information, please refer to <https://www.vernier.com/til/27196>

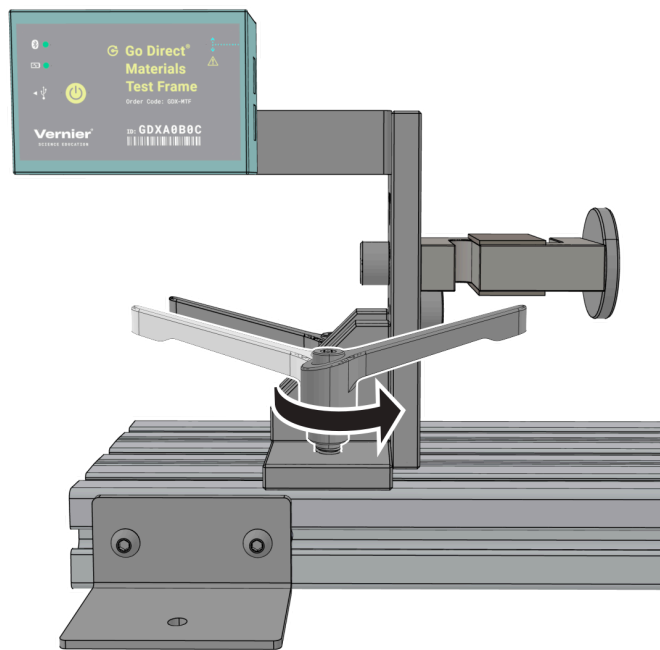
Materials

- ☐ computer, Chromebook™, or mobile device
- ☐ Vernier Graphical Analysis® app
- ☐ assembled Materials Test Frame
- ☐ spring
- ☐ (not included) tag or tape that can attach to the spring (e.g., a paper tag with a string)
- ☐ (not included) marker

1 Loosen the front bolt on the base plate

The handles on the base plate connect to bolts under the plate that hold the base plate in position. The bolts must be loosened so you can move the base plate.

Start with the front handle. Turn the handle clockwise to loosen the bolt.

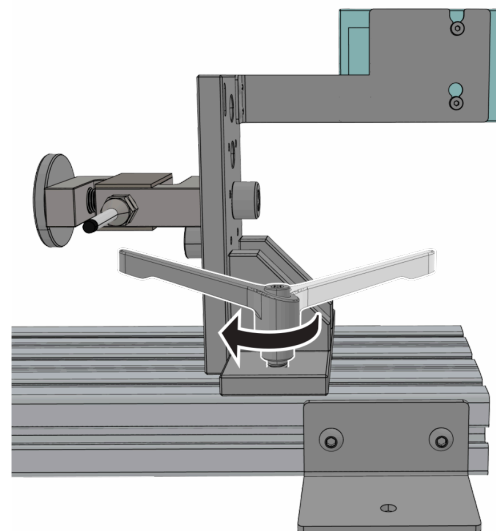
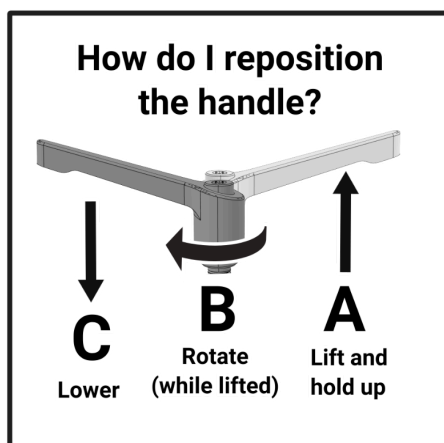


2 Loosen the back bolt on the base plate

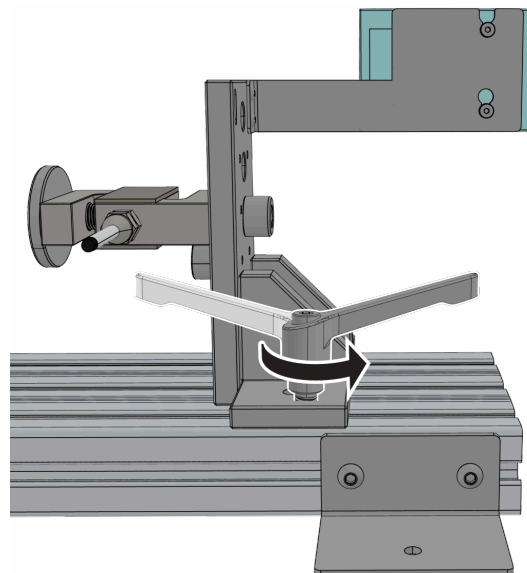
Note: The handles on the base plate are locking handles. This style of handle is designed for constrained spaces where a full 360° rotation isn't possible. If you cannot turn the handle any further in the direction you need to go (e.g., clockwise to tighten), lift up the handle to release it, turn to reposition, and lower. The handle will re-engage and you can turn the bolt.

The back handle must be repositioned before it can loosen the bolt. Follow these steps:

- A. Lift up the handle.
- B. While lifted, turn the handle clockwise as far as it will go.
- C. Lower the handle. It will click into place. If it is stuck in the up position, wiggle it a bit until it drops down.

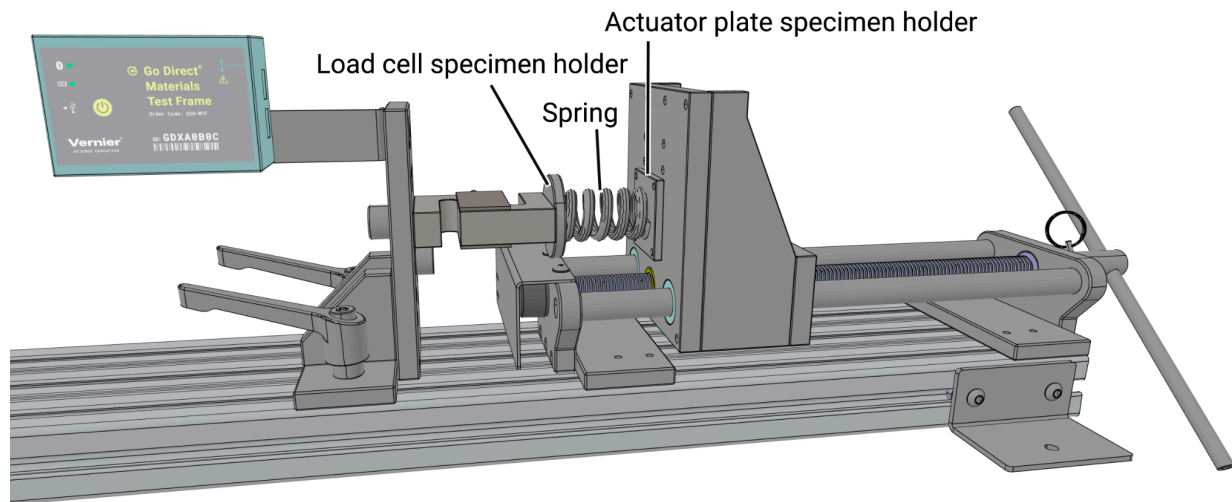


Now that the handle has been repositioned, turn the handle counterclockwise (without lifting) to loosen the bolt.



3 Position the spring

- A. Hold the **spring** against the **actuator plate specimen holder**.
- B. **Slide the base plate** along the track until the load cell specimen holder is in contact with the spring, holding the spring in place.



4 Lock the base plate in place

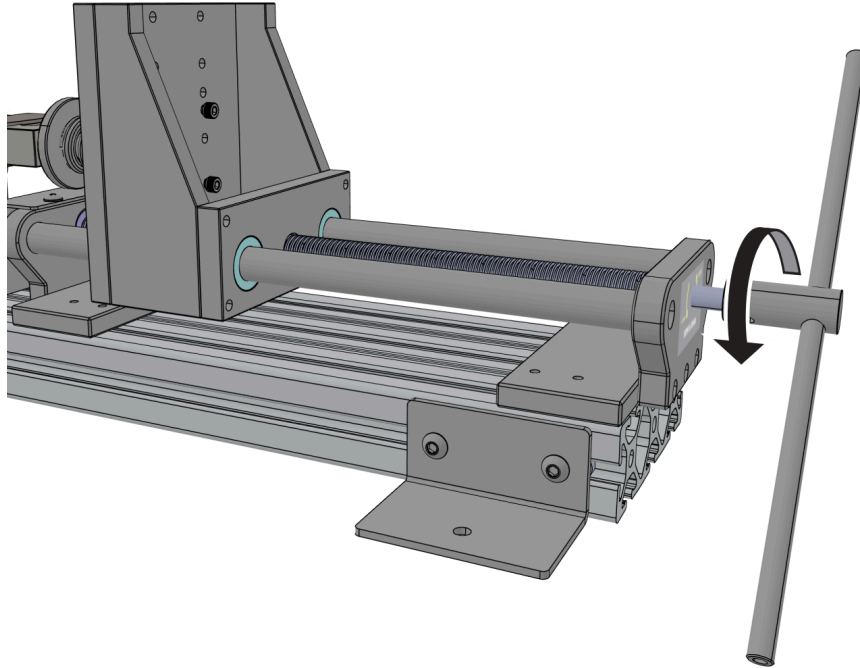
The handles are in the correct positions to tighten the base plate bolts. Without lifting the handles, turn each one clockwise.

5 Set up for data collection

1. Press the **power button** on the electronics box. The LED will blink red.
2. **Launch Graphical Analysis app** on your computer, Chromebook, or mobile device.
3. Click **Sensor Data Collection**.
4. Click **Connect** for your GDX-MTF. The sensor ID is located on the front label of the electronics box.
5. Click **Done**.
6. Use View Options, , to display **1 graph**.
7. To display a graph with displacement on the x-axis and force on the y-axis, **click the axes labels and select the correct channels**.
8. To zero both channels, **click both meters** in the lower-right corner and **choose Zero**.

6 Collect data

1. Click **Collect** to start data collection.
2. **Rotate the actuator handle counterclockwise 1 complete rotation (360°),** using a smooth, consistent motion.
3. Click **Stop** to end data collection.



7 Determine the spring constant

1. Click Graph Options, , and choose **Apply Curve Fit**.
2. Click **Apply** to view a linear curve fit.
3. **Record the spring constant (units of N/mm)** on the tag.
4. **Place the tag on the spring** and store the spring in a safe location. You can use it in the future if you are concerned that the MTF is not giving consistent values.

Set Up for a Tension Test

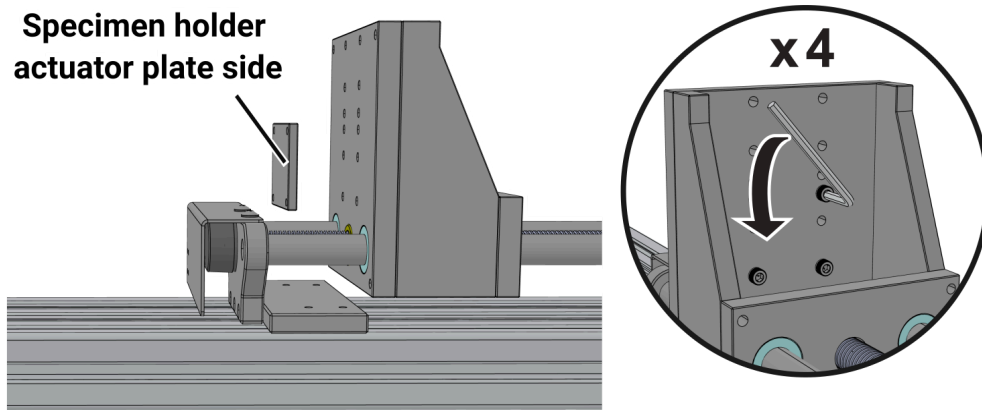
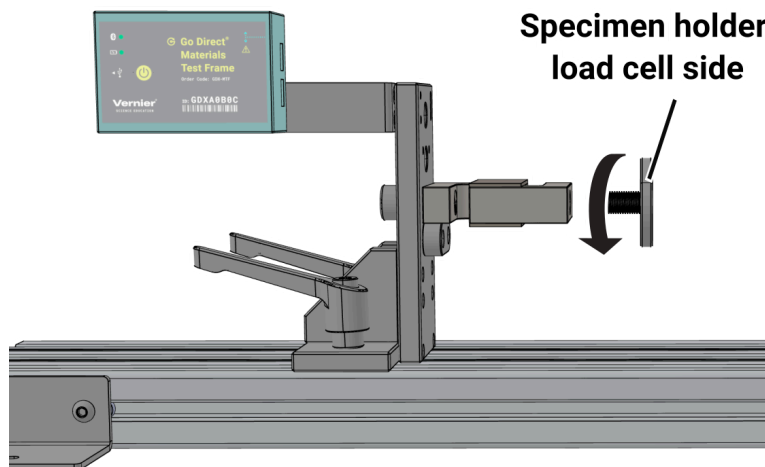
To perform a tension test on a sample, use the tension grip fixtures instead of the specimen holder fixtures.

1 Move the base plate

- A. Turn **both handles counterclockwise** to loosen the bolts.
- B. **Move the base plate away** from the actuator plate.

2 Remove the specimen holders

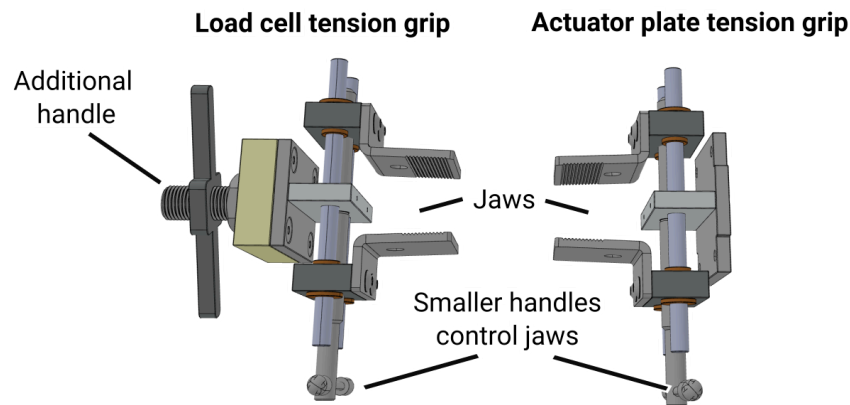
- **Load cell side:** Unscrew the specimen holder and set it aside.
- **Actuator plate side:** Use the small hex key to unscrew the 4 bolts on the specimen holder on the back side of the actuator plate. Save the bolts for Step 4.



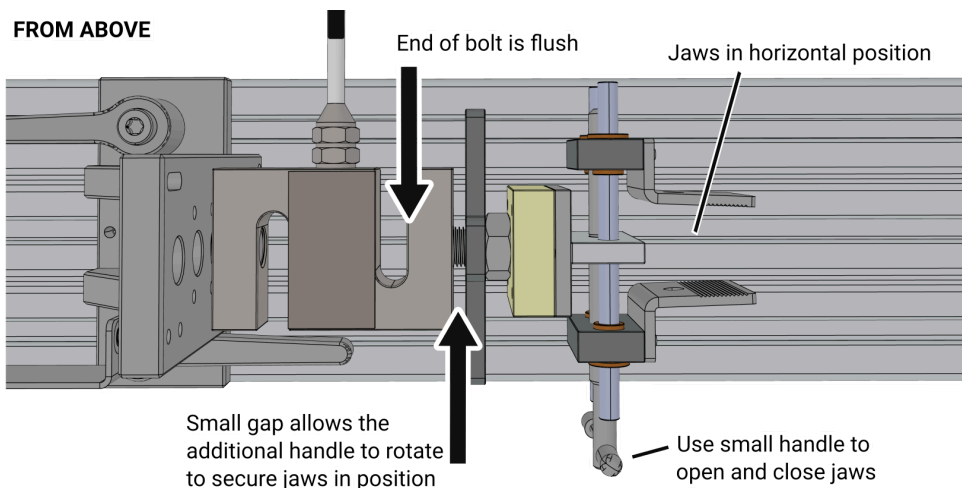
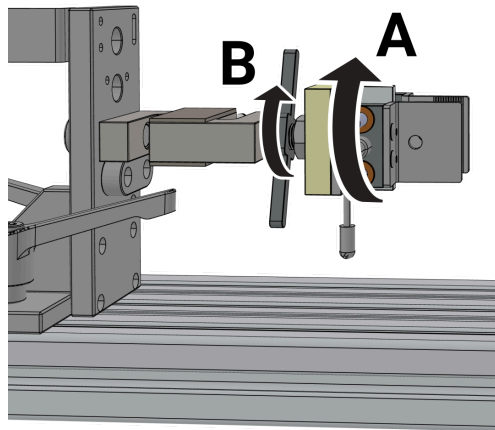
3 Attach the load cell tension grip

Both tension grips have a **small rotating handle with rubber tips** to open and close the jaws.

The **tension grip with the additional large handle** is the one that **attaches to the load cell**.



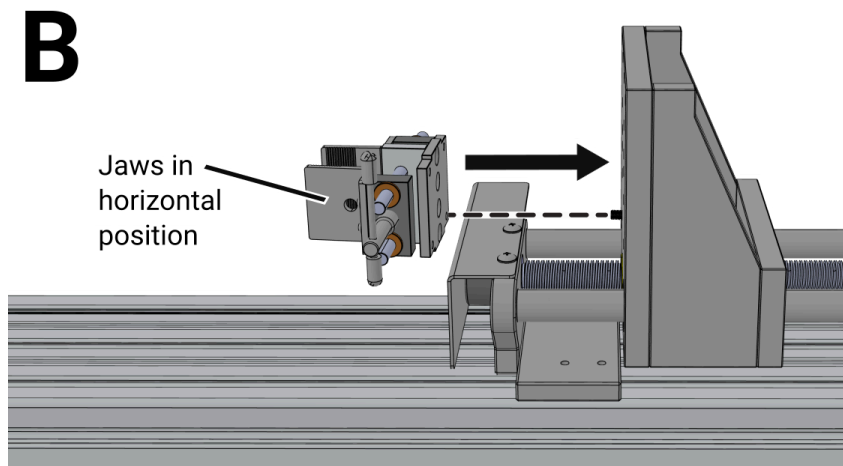
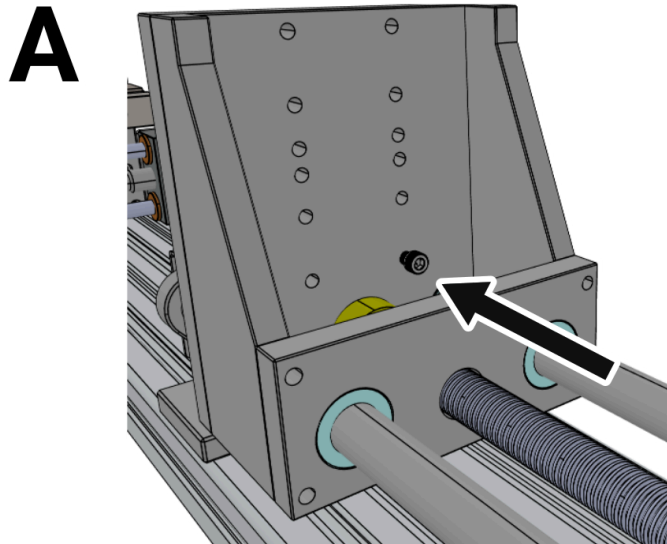
- A. Screw the **tension grip into the load cell** until the end of the bolt is flush with the inner cutout of the load cell.
- B. Orient the jaws so they open horizontally or vertically based on what you need for your sample. Then, **turn the additional handle clockwise** so it tightens against the load cell. This secures the jaws in the desired orientation.



4 Attach the actuator plate tension grip

On the actuator plate, the tension grip can be attached at three heights to align with the load cell. The load cell is in the lowest position, so attach this fixture to the lowest level on the actuator plate.

- A. It can be tricky to align the tension grip with the correct holes. Start by inserting a bolt from the back side into one of the two lowest holes.
- B. Orient the tension grip so the jaws open horizontally or vertically based on what you need for the sample. Then, line up the correct hole in the tension grip plate with the bolt. Hand tighten the bolt.
- C. Screw the remaining bolts into the tension grip plate.
- D. Use the small hex key to tighten the bolts.



You are now ready to insert your sample and collect data.