Melt Station
(Order Code MLT-BTA)

The Melt Station is a sensor used to measure the melting temperature of solid substances.

What is included with the Melt Station?

- Melt Station device
- Power supply
- Package of 100 capillary tubes, one closed end

How the Melt Station Works

The Melt Station contains an aluminum heating block. There are three slots for capillary tubes in the heating block. A capillary tube containing a solid substance is placed in the heating block and the block is heated by an embedded element. An RTD-based temperature sensor, also embedded in the heating block, measures the temperature of the heating block and therefore the capillary tube of substance. The temperature sensor connects to a Vernier data-collection interface, which allows you to monitor and record readings with Logger *Pro*® 3 software or LabQuest® App. The substance to be melted is viewed through a 6X lens.

The temperature control on the Melt Station is divided into three regions.

- The first area, next to the Off position (⏻), is for cooling the heating block after you have completed a melting temperature run. When you turn the control knob to the cooling position, the fan and the blue LED will come on.
- The second area is divided into specific temperature settings. These temperatures correspond to the expected melting temperature of the substance. You will choose one of these settings when the Melt Station has warmed to within about 10°C of the expected melting temperature of your solid sample. The warming rate will slow to ~1.5°C/min at each of these settings.
- The third area is Rapid Heat. In Rapid Heat, the Melt Station will warm at a rate of >10°C/min.

Safety Automatic Shut Off

An important safety feature of the Melt Station is the Automatic Shut Off. After you turn the control knob to heating, an internal timer starts. After approximately 50-60 minutes have elapsed, the Melt Station will automatically turn off the heating element and the yellow LED will come on. To reset the Melt Station, simply turn the control knob to the cooling position or the Off position.

NOTE: Vernier products are designed for educational use. Our products are not designed nor 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.

Symbols on the Melt Station Control Dial

⏻ : Off position

🌀 : Cooling fan on

🌡 : Rapid heating; heating rate at >10°C/min

Features of the Melt Station

- A Gimbal mount allows you to tilt the Melt Station for easy placement of the capillary tube in the heating block and adjust the viewing angle of the lens.
- Uses simple, direct temperature control.
- LED indicator lighting informs you when the Melt Station is heating (red), cooling (blue), or on auto shut down (yellow).
- Data graphed using the Data Mark software feature allows you to mark the beginning and ending of the melting temperature range.
- A cooling fan greatly reduces the time between tests. In most cases, the Melt Station will be ready for the next test in 2–3 minutes.
- An excellent viewing window containing a 6X lens with a typical viewing distance of 5 inches offers a clear view of the capillary tubes up to two feet away. The viewing area is illuminated with focused LED lighting.
- An automatic shut off after approximately 50-60 minutes of heating provides added safety.

How to use the Melt Station

Using the Melt Station with Logger *Pro* 3 Software

The Melt Station connects to a computer with a Vernier data-collection interface, such as LabPro®, Go! Link®, LabQuest® 2, LabQuest®, or LabQuest® Mini. You will run Logger *Pro* 3 (version 3.8.4 or newer) on your computer.

Example Procedure for Computer-Based Data Collection

1. Load a small portion of a solid substance into a capillary tube.
2. Check the control knob on the Melt Station to confirm that it is in the Off position. Connect the Melt Station power supply to a powered electrical outlet.
3. Connect the Melt Station sensor cable to a computer interface.
4. Start Logger *Pro* 3 (version 3.8.4 or newer) on the computer. A live temperature reading will be displayed even when the Melt Station control knob is in the Off position.
5. Carefully place the capillary tube of solid into one of the three slots in the aluminum heating block of the Melt Station. You can tilt the Melt Station toward you slightly for a better look at the heating block.
6. Tilt the Melt Station up or down slightly to get the best view of the solid sample through the viewing lens.
7. The default is 100 readings per minute for 20 minutes, which is suitable for most tests. If you want to change the data-collection parameters, choose Data Collection from the Experiment menu. Click Done to proceed.

8. Click Collect to begin data collection. On the Melt Station, turn the control knob to the Rapid Heat area. The red LED will come on, indicating the Melt Station is heating. Rapid Heat will warm your solid sample at a rate of >10°C/min.
9. Observe the temperature *vs.* time graph. When the temperature is within about 10°C of the expected melting temperature of your solid sample, turn the control knob to that temperature, slowing the heating rate to ~1.5°C/min.
10. Carefully observe your sample. At the first indication of the solid melting, click Mark (or press the D key) to mark the temperature on your graph. When the entire solid has melted, click Mark again to mark the temperature. The two marked points describe the melting temperature range of your solid sample. Text can be added to label the Data Marks by double-clicking their helper objects.
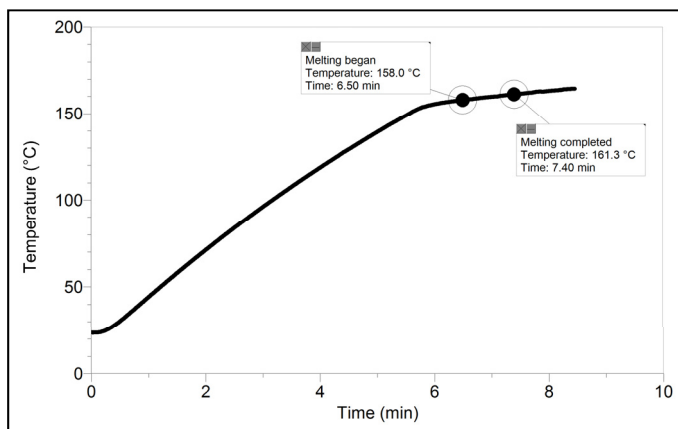

Figure 1 The melting temperature of an unknown substance

11. Stop data collection. Choose Store Latest Run from the Experiment menu. On the Melt Station, turn the control knob to the Fan/Cooling setting. The blue LED will come on, indicating that the Melt Station is cooling.
12. Prepare a second solid sample to test. Observe the temperature of the heating block in the meter of Logger *Pro*. After the heating block cools to a suitably low temperature, repeat Steps 8–11.

Using the Melt Station with LabQuest App

You can connect the Melt Station directly to a LabQuest 2 or LabQuest. You will run LabQuest App version 1.5 or newer.

Example Procedure for LabQuest-Based Data Collection

1. Load a small portion of a solid substance into a capillary tube.
2. Check the control dial on the Melt Station to confirm that it is in the Off position. Connect the Melt Station power supply to a powered electrical outlet.
3. Connect the Melt station to a LabQuest 2 or original LabQuest. Turn on the LabQuest 2 or LabQuest. In a few moments the meter screen will appear and the temperature of the Melt Station's heating block will be displayed.

4. Carefully place the capillary tube of solid into one of the three slots in the aluminum heating block of the Melt Station. You can tilt the Melt Station toward you slightly for a better look at the heating block.
5. Tilt the Melt Station up or down slightly to get the best view of the solid sample through the viewing lens.
6. The default setting is 100 readings per minute for 20 minutes, which is suitable for most tests. If you want to change the data-collection parameters, tap Mode, in the upper right-hand corner of the meter screen and make the desired changes.
7. Start data collection. On the Melt Station, turn the control knob to the Rapid Heat area. The red LED will come on, indicating the Melt Station is heating. Rapid Heat will warm your solid sample at a rate of >10°C/min.
8. Observe the temperature *vs.* time graph. When the temperature is within about 10°C of the expected melting temperature of your solid sample, turn the control dial to that temperature, which will slow the heating rate to ~1.5°C/min.
9. Carefully observe your sample. At the first indication of the solid melting, press the Mark button to mark the temperature on your graph. When the entire solid has melted, press the Mark button again to mark the temperature. The two marked points describe the melting temperature range of your solid sample. Tap Data Marks to the right of the graph to label or delete a Mark.
10. Stop data collection. Tap the File Cabinet icon (upper right-hand corner of the graph screen) to store your first run. On the Melt Station, turn the control knob to the Fan/Cooling setting. The blue LED will come on, indicating the Melt Station is cooling.
11. Prepare a second solid sample to test. Observe the temperature of the heating block in the meter screen. After the heating block cools to a suitably low temperature, repeat Steps 7–10.

Safety

Before performing any maintenance on a Melt Station, please note the following safety points.

- Make sure the unit is unplugged and the heating block is cool before attempting service of any kind.
- Always wear safety glasses while servicing or cleaning the unit.
- Do not open the lower case. All user-serviceable parts are accessed by removing the lens panel only.
- Make sure the unit is properly reassembled and inspected before returning it to the classroom or laboratory.
- Do not service the unit if any parts are missing or damaged.

Routine Maintenance

Cleaning Outside Surfaces

Clean the outside metal surfaces of the Melt Station with a cloth dampened with a mild detergent solution. Do not use organic solvents to clean the Melt Station.

Removing Broken Capillary Tubes

Follow the steps below to remove a broken capillary tube from the Melt Station.
Caution: Do not handle a broken capillary tube with your fingers. Wear safety glasses or safety goggles.

1. Turn off the Melt Station and allow it to cool to room temperature. Unplug the power cord from the device.
2. Place the Melt Station unit on its back side so the capillary tube slots are as close to horizontal as possible. This will make it easier to safely remove the glass shards.
3. Remove the two threaded screws holding the lens panel in place. Set the screws and the viewing lens aside.
4. Use a 3/32 inch hex key to remove the two screws holding the metal spring fingers in place. Set the screws and spring fingers aside. Use the same hex key to loosen the screw holding the glass window in place. Slide the glass window up to remove it, and set it aside. **Caution**: The edges of the glass may be sharp.
5. Use an appropriate tool to carefully remove the broken capillary tube from its slot and deposit it in a glass waste container. If the capillary tube is loose in the slot, you can very carefully tip the Melt Station over to slide the tube into a waste container.
6. Replace the glass window, metal fingers, and viewing lens. Carefully tighten the screws to be snug rather than extremely tight. Remember that you may want to remove these pieces again in the future.

Important Safety Information

The Melt Station is designed for use in an academic laboratory. Its intended purpose is to determine the melting temperature of a solid substance in the temperature range between ambient and 260°C. The safety guidelines listed below must be followed strictly during the operation of this device. Failure to comply with these guidelines violates the standards of safety set forth in this document and the standards expected as good laboratory practice.

- Always wear safety goggles or safety glasses when using the Melt Station.
- Do not use the Melt Station for any purpose other than its intended use, which is to measure the melting point of a solid substance.
- Use the Melt Station under the supervision of a qualified chemistry instructor.
- Place the Melt Station on a clean, level surface.
- Make sure the Melt Station is a safe distance from solvents, containers of liquid or gaseous substances, and sources of water.
- Do not use the Melt Station with flammable liquids or gases.
- Do not allow the device to become wet. If it does, disconnect power to the device immediately and allow it to thoroughly dry.
- The BTA connector of the Melt Station should be used only with a Vernier interface, including: LabPro, Go! Link, LabQuest 2, LabQuest, or LabQuest Mini.
- Do not turn on the Melt Station until the RTD is connected and the temperature of the heater block is known.

- Do not leave the device unattended while heating; monitor temperature at all times.
- Turn off the Melt Station immediately after all testing is completed.
- Do not alter or remove the protective metal walls that surround the heating block of the Melt Station.
- The Melt Station is designed to operate in an upright position.
- Do not touch the heating block while it is hot.
- Logger *Pro* software (version 3.8.4 or newer), LabQuest 2, or original LabQuest (App version 1.5 or newer) will display the temperature of the heating block immediately after the Melt Station is connected. Check the temperature of the heating block before inserting a capillary tube of solid sample.
- The heating block can remain hot for a short period of time after use, even when off.
- Use the Melt Station in a well-ventilated room.
- The Melt Station is not designed for liquids or wet environments.
- The Melt Station is not designed or intended for use with samples that could explode or ignite by heat, friction, or spark.
- While some routine maintenance can be performed on the Melt Station, these tasks should be performed only by qualified personnel.
- Do not use the Melt Station if any malfunction is suspected.
- Do not modify or install additional parts to the Melt Station.
- Unplug the Melt Station before storing.

Melt Station Specifications

Dimensions: Base–13 cm × 15 cm × 1.5 cm, Body–9 cm × 9 cm × 24 cm

Melt Station weight: 1.0 kg (2.2 lbs.)

Melt Station + AC adapter weight: 1.2 kg (2.6 lbs.)

Range: ambient to 260°C

Temperature sensor: Class A, Platinum resistance temperature detector (RTD)

Resolution: 0.10^{o}C

Accuracy: $\pm 0.31 + 0.0006T$, where T is the temperature in Celsius
　　Typical: ± 0.4 °C (<200 °C); ± 0.5 deg C (>200 °C)

Calibration: factory calibrated

Power: 24VDC to unit, universal AC adapter 100–240 VAC 50–60 Hz input

Power consumption: 40W max., < 0.5A @ 110V

Safety shut down: the heating block is automatically powered down after approximately 50-60 minutes of heating.

Capillary tubes: 1.4–1.8 mm outside diameter, 100 mm length

Capillary tube slots: 3

Viewing lens: 27 mm diameter (functional), 30 mm (actual)

Lighting of capillary slots: 3 white LEDs

Lighting of control dial: Red LED (indicates heating mode), blue LED (indicates cooling mode with cooling fan running), yellow LED (safety shut off activated)
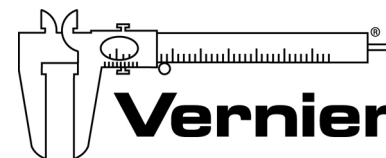
This sensor is equipped with circuitry that supports auto-ID. When used with LabQuest 2, LabQuest, LabQuest Mini, LabPro, and Go! Link, the data-collection software identifies the sensor and uses pre-defined parameters to configure an experiment appropriate to the recognized sensor.

Calibration Information

The temperature sensor embedded in the aluminum heating block of the Melt Station will never need to be calibrated. The sensor is carefully calibrated before it ships, and this unique calibration is stored on a smart chip in the sensor. **Note**: There is no method to perform a calibration of this sensor in any of our software programs.

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.