2023

Quick Start Guide

Preliminary

LABTECH MODEL 87 – PETROLEUM WAX MELTING POINT APPARATUS

PDS Performance Distillation Solutions®

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This guide contains basic instructions for the set-up and operation of the Model 87 wax melting point apparatus for determination of melting point of petroleum waxes by cooling technique in accord with the ASTM D87 Test Method.

Introduction

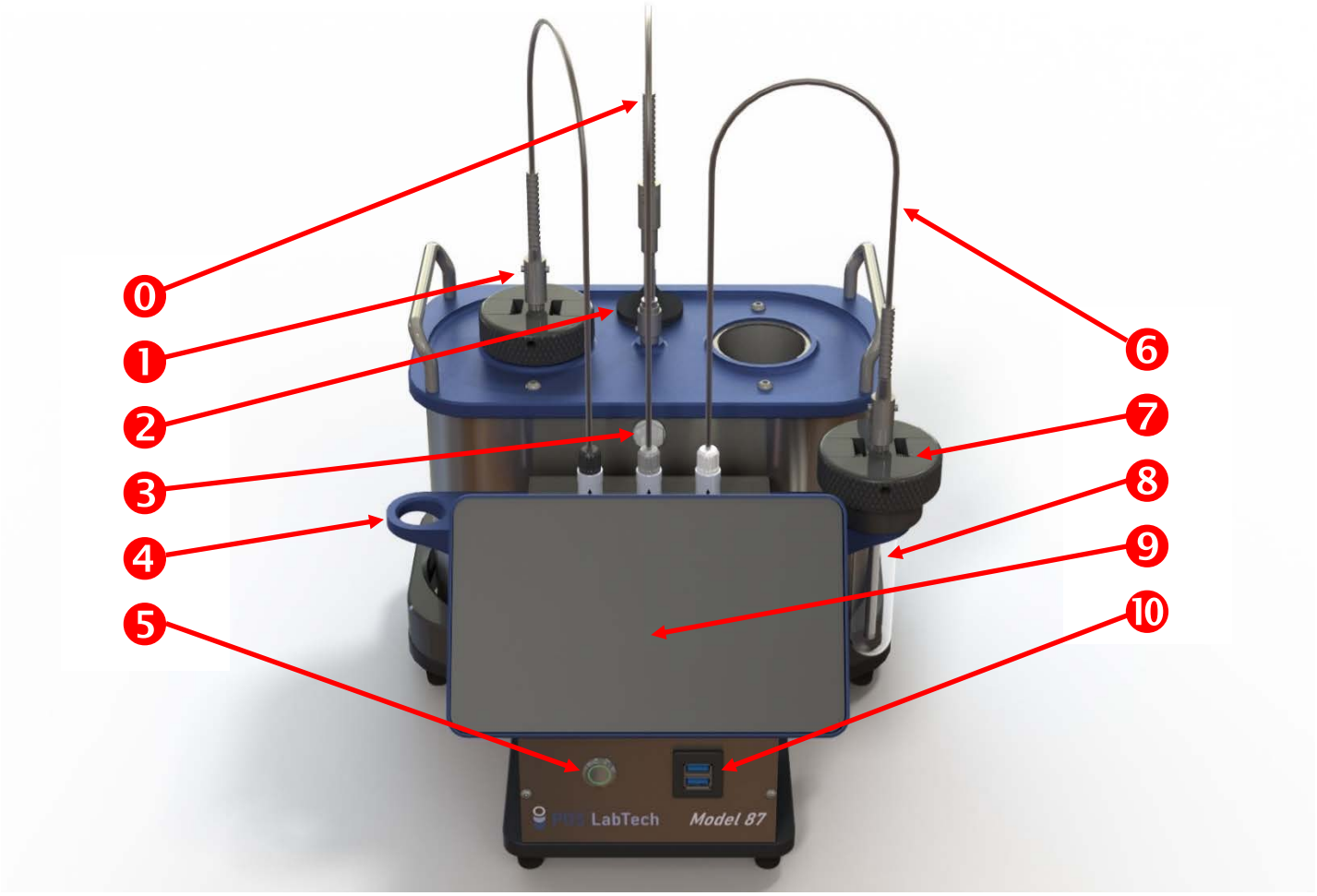

Figure 1: PDS LabTech Model 87 Components

0	Air/Water Bath RTD Temperature Sensor
1	Left Test Cell RTD & Sample Vial Holder – shown inserted in testing position
2	Water Bath Fill/Drain Cap
3	Water Bath Sight Gage for Checking Water Level
4	Sample Vial Rest
5	Power On/Off Switch & LED Indicator
6	Right Test Cell RTD
7	Right Sample Vial Holder – shown in Sample Vial Rest
8	Borosilicate Glass Sample Vial - 25 mm OD x 100 mm Long
9	Color LCD Touchscreen
10	USB 3.0 Ports

Setup

Place the instrument base on a sturdy flat lab bench or table top with approximately 12” (30 cm) wide and 12” (30 cm) deep of free space that is within 3 ft (1 m) of an AC mains receptacle. Be careful to route the power cord from the AC/DC power adapter from the underside of the instrument towards the rear.

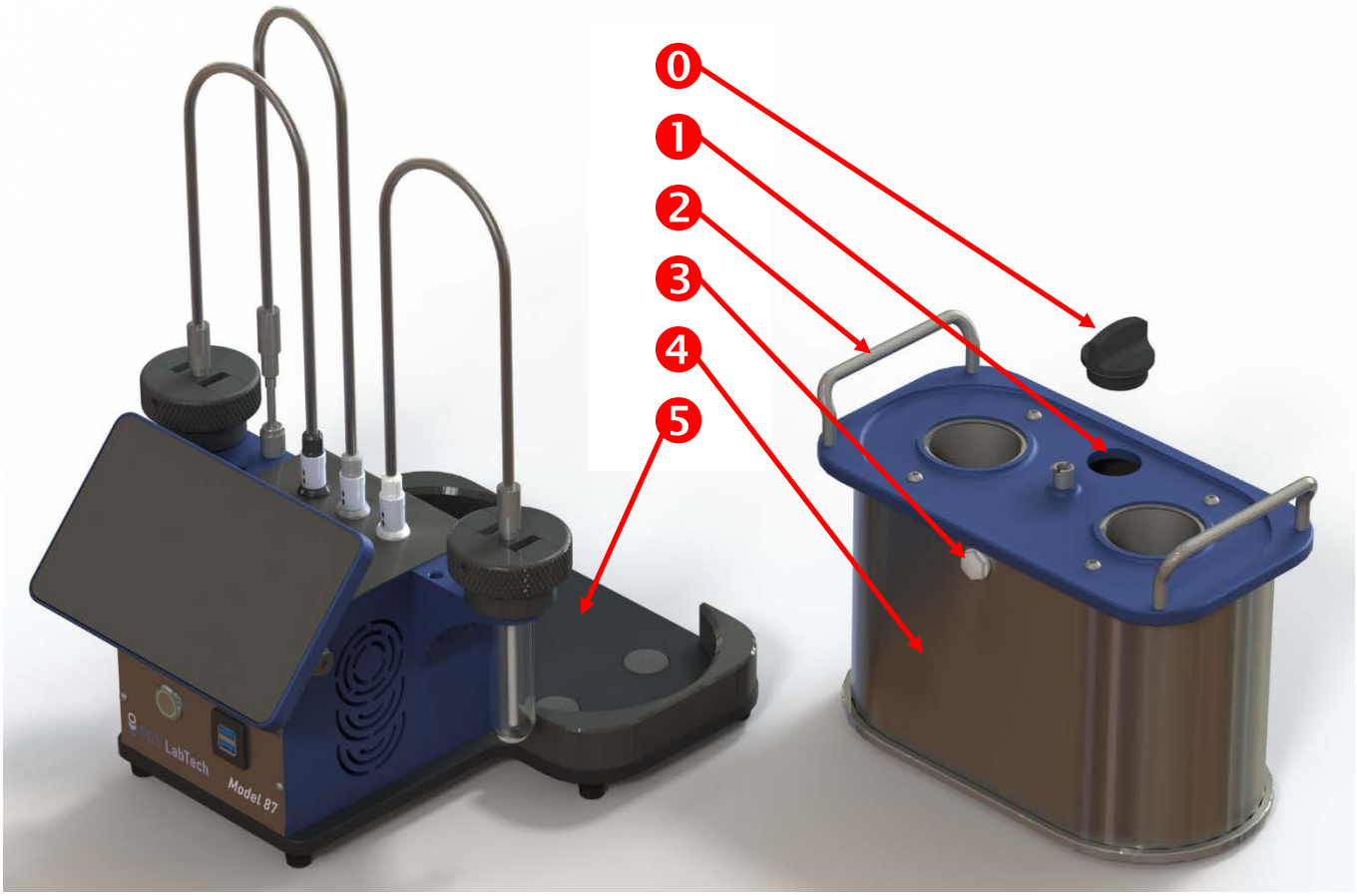

Figure 2: Instrument Base with Water Bath Removed

0	Water Bath Fill/Drain Cap – shown removed
1	Water Bath Fill/Drain Port
2	Bath Lift Handle
3	Water Bath Sight Gage for Checking Water Level
4	Water Bath – shown removed from Instrument Base
5	Instrument Base – shown with Water Bath removed

Setting up the Air/Water Bath: Remove the Air/Water Bath from the instrument base and loosen the black Fill/Drain Cap (Item 2 on Figure 1) by turning it counter-clockwise. Fill the bath with tap water at room temperature between 22 °C and 26 °C as per ASTM D87. An algaecide water additive, such as is suitable for use in a water humidifier, may be used. The wetted bath components are stainless steel and should not corrode. Fill the bath until the water level is in the center of the small Water Bath Sight Gage 3 in the front top of the bath.

Installing the RTD temperature probes: The three supplied RTD temperature probes each have a color-coded boot on the plug that corresponds with a matching colored ring on the proper socket. The three RTD sockets are located on top of the instrument between the back of the Color LCD Touchscreen display and the Water Bath.

- Black: Left Test Cell RTD Probe
- Grey: Bath Temperature RTD Probe
- White: Right Test Cell RTD Probe

Align the red dot on each plug with the red dot on the same color socket and press in until a click is heard/felt.

Plugging in the AC/DC power adapter: Plug the supplied power adapter into an AC mains 100-240 VAC 50/60 Hz receptacle.

Connecting the keyboard: The supplied wireless keyboard is factory installed. Turn on the power switch on the keyboard.

Loading a glass sample vial into the Sample Vial Holder: Grasp the black Sample Vial Holder and with two fingers squeeze the spring loaded clamps inward. The clamps will pivot open to permit the top lip of a Glass Sample Vial to be inserted. Gently insert the vial while slowly releasing the clamps, which will automatically center and firmly hold the vial in place.

Figure 3: Sample Vial Holder and Glass Sample Vial [Inset showing clamps depressed)

Calibration: The Model 87 is supplied by the factory fully calibrated and configured with the default ASTM D87 test parameters. Periodically verify the reading of each of the RTD temperature probes in a constant temperature bath against a known reference thermometer. If re-calibration is necessary, see the Maintenance & Calibration section.

Operation Overview

After pressing the **Power On/Off Switch**, the instrument will boot-up and present the main run screen as shown below. On the main screen, the temperature measurement of the precision RTD sensors for the left and right cells as well as the bath water (shown on bottom bar) are displayed in real-time. From this screen, the **Start** buttons may be pressed to start recording temperature measurements for the left and/or right cells. The instrument will follow the default ASTM D87 test protocol unless modified. When a **Start** button is pressed, the button name will toggle to **Stop** and vice-a-versa. A test may be started or stopped at any time for either the left or right cells. A test will auto-stop once it reaches the set maximum number of readings. At the conclusion of a test, all data (sample ID, MP, Date, Time, and temperature measurement points) will be saved to the internal memory. The **Configure** button may be pressed to modify test parameters and to enter RTD calibration data.

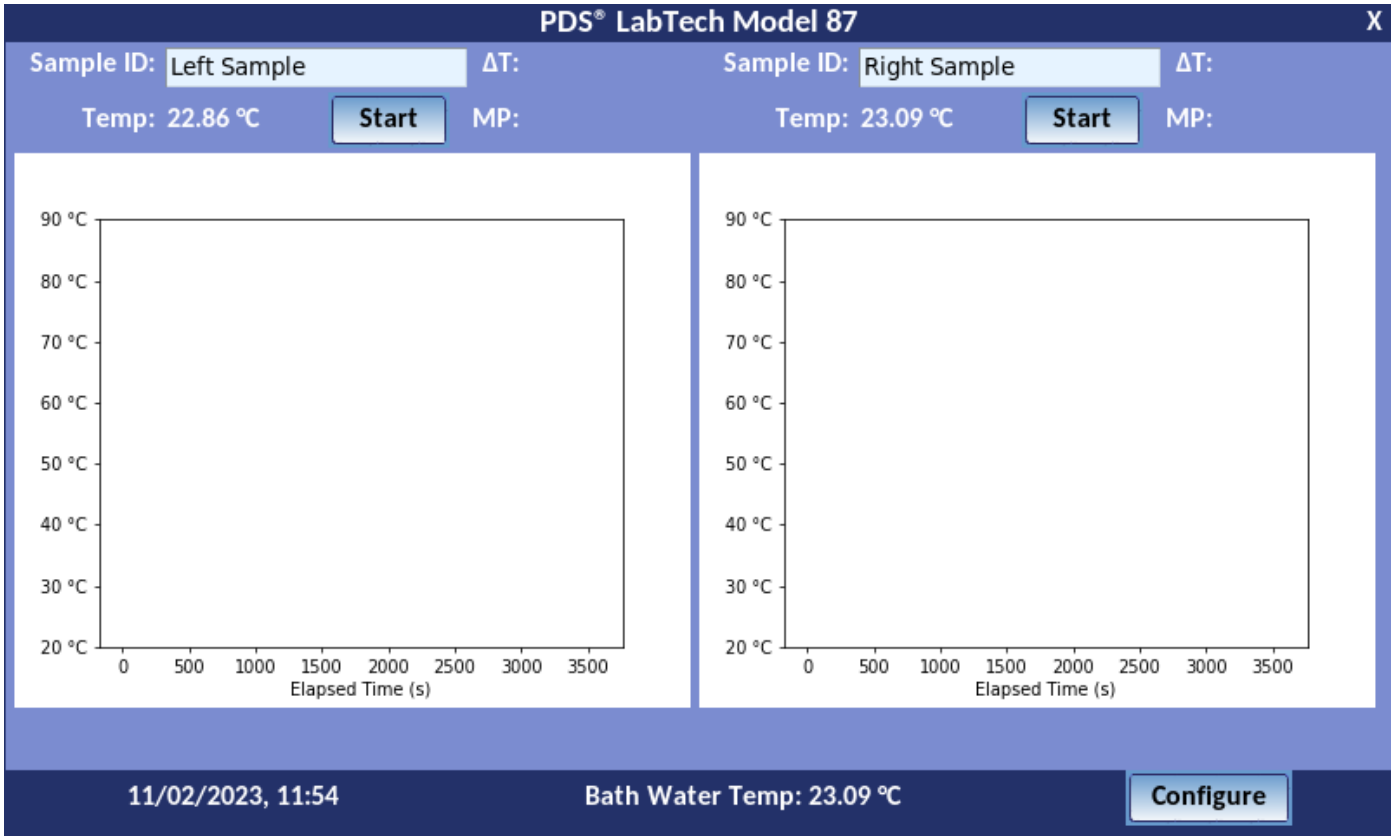

Figure 4: Main run screen showing both left and right cell data.

Sample ID: Enter up to 50 alpha-numeric characters. Only 22 characters are visible but the keyboard arrow keys can be used to scroll left or right within the field.

ΔT: The calculated difference between the min and max of the last five temperature readings for the left or right cell. ASTM D87 defines the melting point as a plateau in the data where this difference is 0.1 °C or less.

Temp: The measured temperature of the left or right cell in °C at the Sampling Delay (ASTM D87 default is 15 sec.)

MP: The determined Melting Point of the left or right cell in °C. Note, ASTM D87 does not define melting points below 38 °C. The software will display <38 °C if no melting point is found before reaching 38 °C

Operation Overview Continued

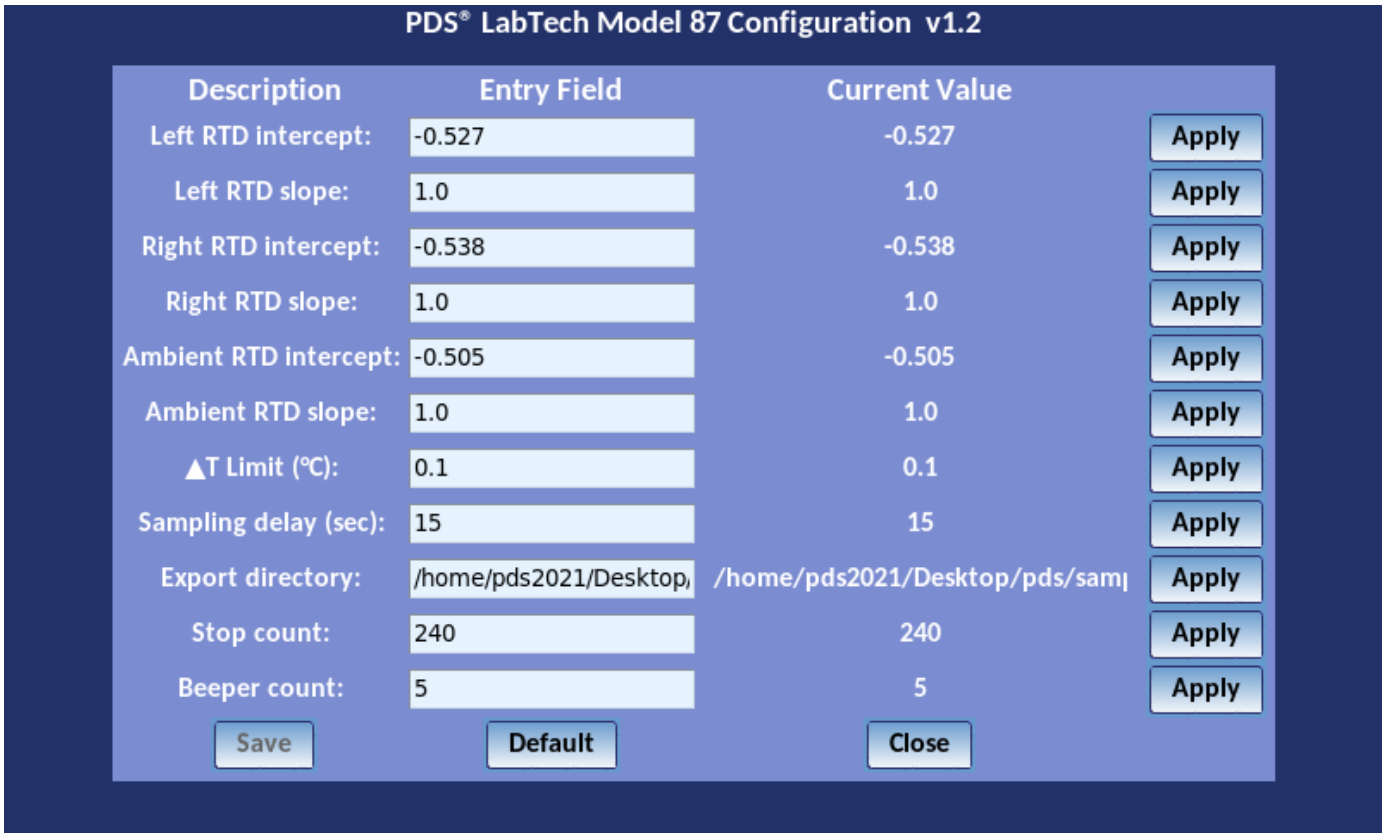

Figure 5: Configuration window with test parameters (note software version number shown at top)

RTD Intercepts: Use for a single point temperature calibration offset when compared against a reference thermometer. When using just a single point calibration offset, set the corresponding RTD Slope = 1.0

RTD Slopes: Use only when employing a linear fit (y = mx + b) temperature calibration. Where y = corrected temperature, m = RTD Slope, x = uncorrected temperature, and b = RTD Intercept in the equation.

ΔT Limit: The temperature difference limit for determining the melting point plateau (ASTM D87 default is 0.1 °C)

Sampling Delay: The amount of elapsed time between temperature readings (ASTM D87 default is 15 seconds)

Export Directory: The directory on the local memory or external USB memory stick for storing measurement results (.csv format). The default is …/Desktop/pds/samples

Stop Count: The number of consecutive temperature readings to store from Start until the system Auto Stops.

Beeper Count: The number of beeps made when a successful determination of melting point is found. (A count of 5 will beep 5 times while a count of 0 turns off the beeper)

Apply Button: Save the changes to memory for all tests until the power is cycled

Save Button: Saves the Applied changes to memory in the instrument and will remain after power is cycled

Default Button: Resets all relevant test parameters back to the ASTM D87 default values

Close Button: Closes the Configuration window and returns to the main run screen.

Operation Overview Continued

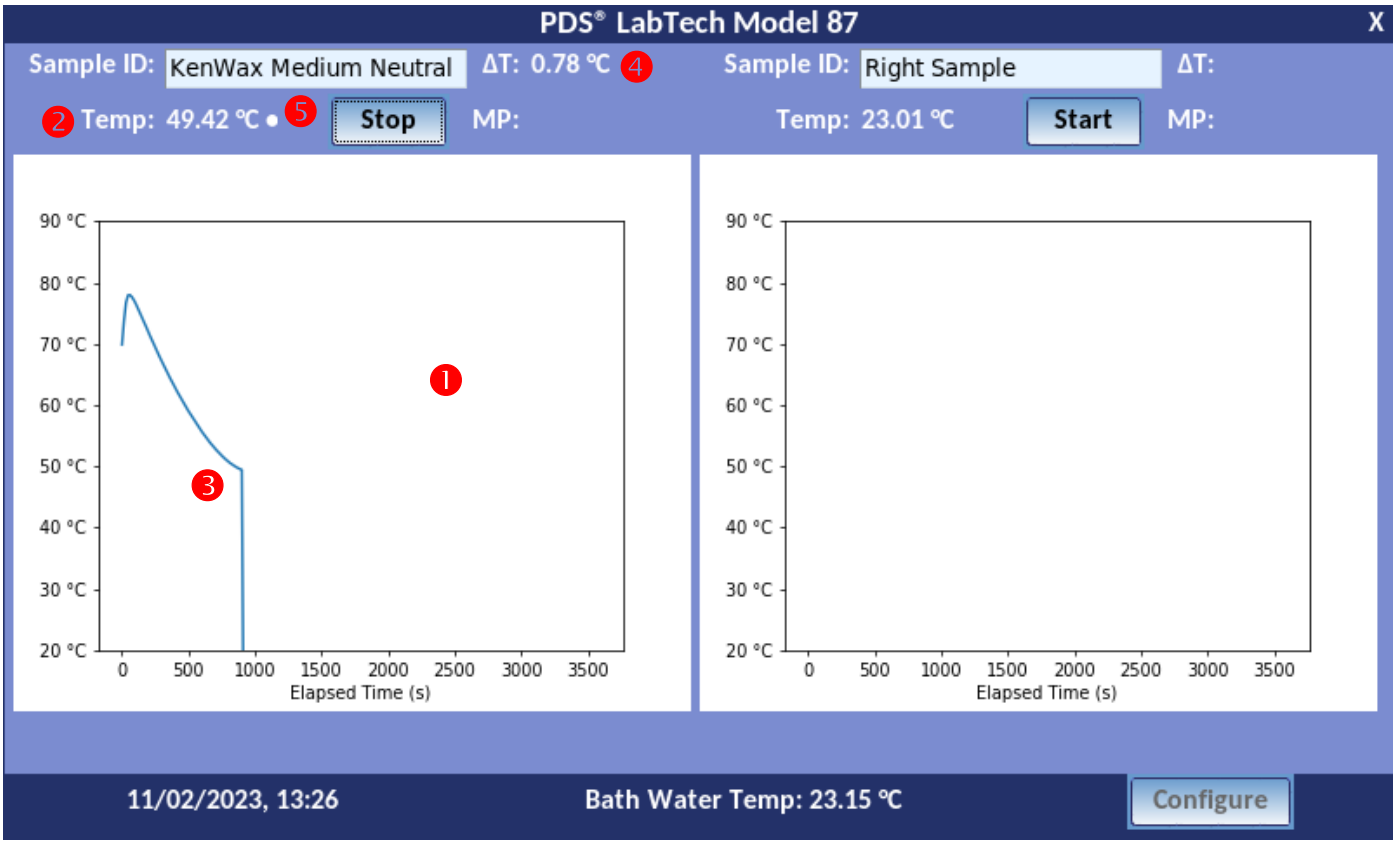

Figure 6: Main screen with test running on the left cell only.

When a new test is started the temperature/time graph background color will be white 1. As the test is progressing, the temperature 2 will be updated following the test parameters (ASTM D87 default is every 15 seconds) and the graph will indicate the elapsed temperature profile 3 since the beginning of the test. Additionally, the ΔT calculation 4 will update with each successive temperature reading. Note that a new test requires the first five consecutive readings before a ΔT is calculated and displayed. A blinking dot 5 to the right of the Temp: reading indicates that a test is in progress.

When a melting point is determined (ASTM D87 default is five consecutive temperature readings differing by no more than 0.1 °C and as indicated by the reported ΔT value) a horizontal red line will be drawn visually indicating the melting point plateau and the graph background color will change from white to green (see Figure 7). The melting point value will be shown as MP: XX.XX °C. Additionally, if enabled, a beeper will sound indicating that a melting point has been determined.

Operation Overview Continued

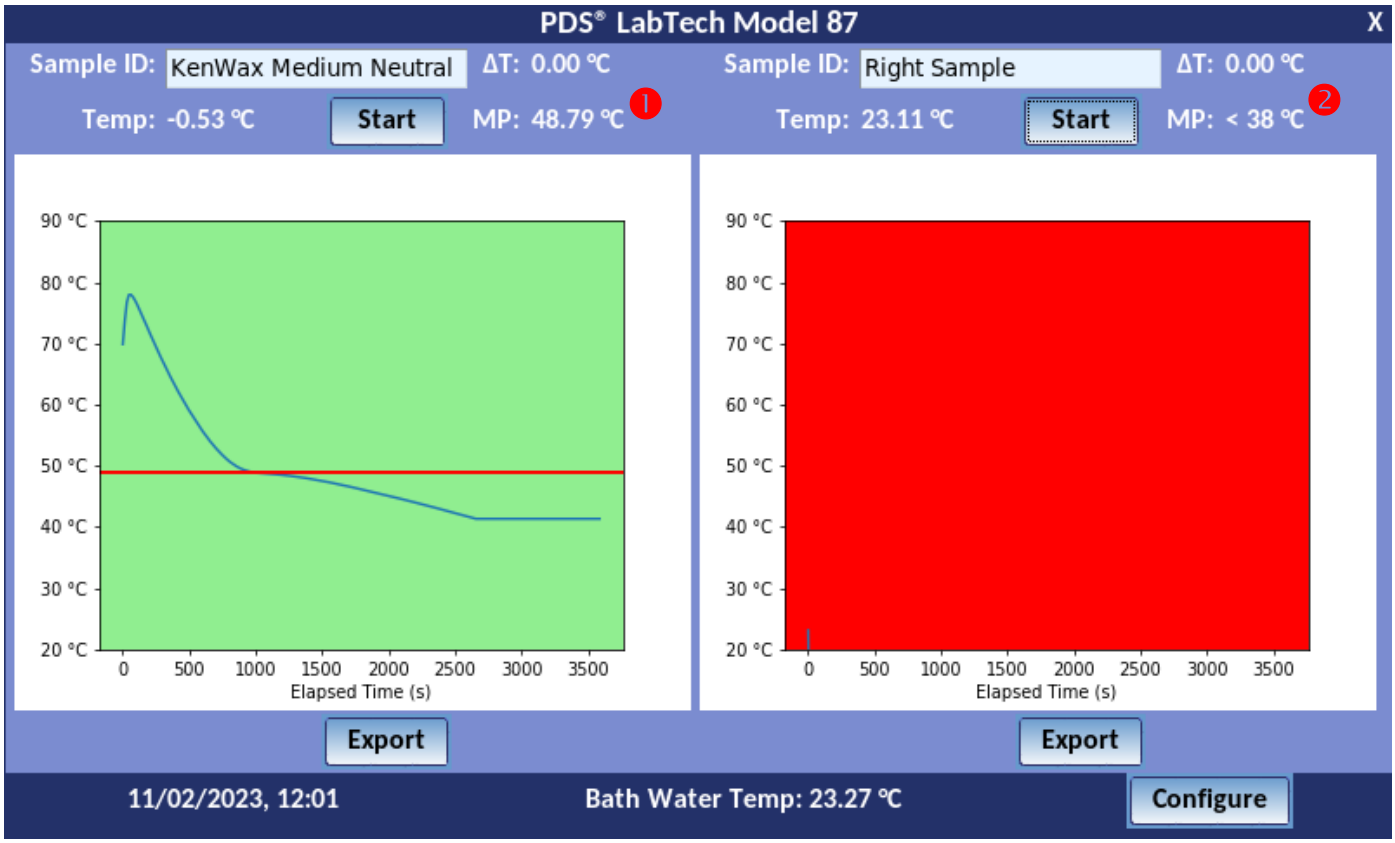

Figure 7: Main screen with a successful melting point determination on the left cell and a failure on the right

In the above screen view the test on the left cell was successful in finding a melting point (MP: 48.79 °C ❶) while the test on the right cell failed as the temperature cooled below 38 °C with no melting point found. The system displays MP: < 38 °C ❷ and no beeper will sound for the right test cell.

When a test is complete, either automatically at the end of the set total elapsed test time (default 3600 seconds or 1 hour), or when pressing the **Stop** button, a new button labeled **Export** will appear.

Press the **Export** button to open a file menu window for exporting a data file from the internal memory storage to an external USB memory stick. File names consist of the Sample ID name entered and a unique date-time stamp number. Files are shown in chronological order as they are saved in memory.

Under the **Configure** menu, files can be set to automatically save to a connected USB memory stick or other file storage system.

Running a Test

1. **Power-Up**: Press the Power On/Off Switch. The LED on the switch will blink a blue light slowly indicating that the instrument is in boot-up mode. The screen will display the PDS logo followed by several messages as the software is loading. Once the Power Switch LED is a solid blue and the main screen appears (see Figure 4) the instrument is ready to begin testing.
2. **Preparing the Air/Water Bath**: If the water bath is already filled with water, verify that the Bath Water Temperature as indicated on the lower center bar of the LCD display is between 22 °C and 26 °C. Adjust the bath temperature accordingly by emptying the bath and refilling with properly tempered water. The Air/Water Bath RTD Temperature Sensor may be used as a digital thermometer. Remove it from the bath by pressing down and turning a quarter turn and then pulling upwards. This can then be placed into a pitcher or container of tap water to verify the water temperature before filling the bath. The bath holds approximately 2 L of water from empty to the fill mark in the Water Bath Sight Gage.
3. **Preparing a Sample for Test**: Heat the wax sample(s) to be measured in a suitable container in an oven or water bath to at least 8 °C (15 °F) above its expected melting point. For samples of unknown melting point, heat the wax sample to 10 °C above the temperature at which the sample turns completely liquid (molten) but no higher than 93 °C (200 °F). Care should be taken to wear proper personal protective equipment (PPE) such as high-temperature gloves to avoid burns when working with the molten sample or hot containers.
4. **Preparing Instrument for Test**: Ensure that the left or right test cell, which will be used for this test, is idle and not running a test. Remove any previously run sample by carefully removing the Glass Sample Vial from the Sample Vial Holder and discarding in an appropriate manner. Wipe the RTD temperature sensor off with a suitable solvent and ensure that it is dry. Enter the Sample ID for the appropriate left or right test cell.
5. **Loading Sample Vial**: Pour the molten wax sample into a 25 mm O.D. x 100 mm L Glass Sample Vial to a height of 51 mm (2”) as measured from the bottom. PDS® brand Glass Sample Vials have a convenient fill line etched onto the glass for ease of filling. Immediately attach the Glass Sample Vial to the left or right Sample Vial Holder and then place the assembly into the left or right test cell on the Water Bath.
6. **Starting Test**: With the Sample Vial Holder and molten sample in place in the test cell, press the corresponding **Start** button to begin temperature recording.
7. **Interpreting Results**: If a temperature plateau is determined before the end of test time (defined as the set Stop Count multiplied by the Sampling Delay time) where 5 consecutive readings are within the set ΔT limit (ASTM D87 default is 0.1 °C), then the average temperature of these five consecutive readings is reported on the LCD display as the melting point and indicated as **MP: XX.XX °C**. If no melting point is determined by the end of test time, then the **MP:** will show as blank with no numerical value. If the temperature of the sample cools to 38 °C or below before the end of test time, the melting point will be indicated by **MP: <38 °C**
8. **Reporting Results**: Report the indicated MP value in °C from the LCD display to at least the nearest 0.05 °C (0.1 °F) for either the left or right test cell as the “Petroleum Wax Melting Point (Cooling Curve), Test Method ASTM D87 – Automatic Apparatus”

Maintenance & Calibration

The LabTech Model 87 apparatus is robust with only a single moving part (cooling fan for the electronics) and generally will not require much maintenance. However, it will require the following recommended periodic cleaning and calibration:

- **Air/Water Bath**: Weekly, the bath shall be drained and rinsed with fresh tap or distilled water, and replaced with fresh water. This will reduce the chances for any algae to form in the bath water. Alternatively, an algaecide water additive, such as is suitable for use in a laboratory water bath, may be used. However, it is still recommended then that the bath water be changed at least monthly. The wetted bath components are stainless steel and should not corrode when wetted with tap or distilled water.
- **RTD Temperature Probes**: After each test, wipe the exposed portion of the stainless steel temperature probes for the left and right test cells with a suitable solvent for removing wax residue and then dry.
- **LCD Touch Screen Display**: Periodically, wipe clean with an alcohol-based or similar screen wipe or soft microfiber lens wipe.
- **Instrument Housing**: As required, wipe clean with a damp cloth or with a non-aggressive cleaner such as glass window cleaner and a soft towel.
- **Calibration**: The three RTD temperature probes should be verified at least yearly and re-calibrated as required using a stable (+/- 0.02 °C maximum variability) liquid constant temperature bath or dry-block calibrator and traceable reference thermometer. Contact PDS for details regarding return-to-depot for service/calibration.

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Specifications

Model No.	LTM-87
Dimensions (W x D x H)	11.5 in. x 12.0 in. x 9.0 in. (29.2 cm x 30.5 cm x 22.9 cm)
Weight (dry)	20.0 lbs. (9.1 kg)
Water Bath Capacity	2 L
RTD Temperature Sensor Calibrated Range	20 °C to 100 °C
RTD Temperature Sensor Accuracy	+/- 0.05 °C
Electrical Specifications – Instrument Power	5.1 VDC at 3A peak
AC/DC Power Adapter (supplied)	100-240 VAC, 50/60 Hz, 150 W max
Operating Conditions	15 °C to 30 °C, 10% to 75% R.H. (non-condensing)
Data Output	USB 3.0