REACH Devices RD-MP

Digital melting point determination apparatus

User Manual

Innovative equipment designed and manufactured by REACH Devices

6525 Gunpark Drive
Suite 370-179
Boulder, Colorado, 80301, USA

Phone: (720)-288-5722

e-mail: support@reachdevices.com

General description

The REACH Devices digital melting point determination apparatus (RD-MP) is a “heated aluminum block” type device. The RD-MP allows for analysis of up to 6 standard sample-filled capillaries. Measurements can be conducted in 25 to 250°C range with four selectable heating rates (1.5, 3, 6 and 12°C/min). The heating rate is independent from the current unit temperature, so the RD-MP does not need any adjustments during measurements. There is also a “fast” mode, when full power is applied to the heating element, and temperature rises rapidly but not linearly.

The heating rate can be changed during actual measurement if needed. In fact, if an approximate melting point of the sample is known, an appropriate starting temperature can be rapidly achieved in “fast” mode, after which rate may be decreased as needed to perform an actual measurement.

Sample heating will stop automatically at 250°C, after which the unit will cool down the heating element using the embedded rapid cool-of fan, and switch itself off in about 15 min. The measurement can also be stopped by user at any time.

The glass plano-convex lens along with the “super-bright” white LED provides a good view of the sample(s) during the test with minimal optical distortions. The lens also provides an extra degree of protection against accidental touching of the heating element.

The temperature is measured by three platinum resistance temperature detectors (RTDs) followed by zero-drift operation amplifiers. The long-term accuracy of temperature measurements is about ±0.5°C. The final, displayed temperature value is obtained by comparing the readings of the three independent RTDs. When all three readings are essentially equal, then their average signal is used to calculate the displayed temperature. If one of the three RTDs is not in agreement, it is ignored, and the remaining two reading are used. If all three readings differ, the message “FAIL” will be displayed on the LCD. In this unlikely case, the device needs to be returned for servicing.

The user should unplug the RD-MP when the device is not in use.

Operating the unit

RD-MP is controlled by four buttons “On,” “Run,” “Faster,” and “Slower” which are located on the front of the unit.

To power up the RD-MP, plug in the power cord and press the “On” button. The sample holder light, LCD back-light and both fans will turn on. The LCD will show the current heating block temperature, “idle” message and the default heating rate (6°C/min).

Note that pressing the “On” button again will not turn the unit off. However, after 10 min in idle mode, the unit will switch itself off automatically.

To start the measurement process, the user should press the “Run” button. The “idle” message on LCD will change to “running”, one fan will stop, and the temperature will rise. During the run or before the run (when RD-MP is in idle mode), pressing the “Faster” or “Slower” buttons multiple times will allow the user to sequentially select heating rates between 1.5°C/min all the way to the “fast mode,” the current rate being displayed on the LCD.

User may stop the the run any time by pressing the “Run” button again. The RD-MP will switch to idle mode, the “idle” message will appear on the LCD, and the rapid cool-off fan will start working. The temperature will start to drop rather rapidly. Usually, about 10 min in the idle/cooling mode at room temperature is enough time for the unit to cool off from 50°C to 45°C. If

the “Run” button was not pressed again within 10 min of idle mode, the RD-MP will switch itself off automatically.

If the user does not stop the run manually, the temperature will rise to 250°C, after which the unit will go into idle mode and then switch itself off in about 10 min.

Checking the unit

About once a year the unit RTD health should be checked as follow:

1. Cool the unit to the room temperature.
2. Turn unit on and press FASTER and SLOWER buttons simultaneously. Three temperature readings will appear on LCD. The difference between 3 readings should be less than 5 degrees.
3. Press RUN button and then FASTER button until unit is in fast mode.
4. Wait until the stage heats up to about 200°C. Press SLOWER button until 1.5°C/min message is shown. Wait about 1 minute.

Depress SLOWER button and while keeping it pressed depress the FASTER button, and then let go of both buttons. Again, three temperature readings will appear on LCD. The difference between 3 readings should be less than 5 degrees.

If the test above is passed the unit is fully functional. If only two out of three temperature measurements are within 5 degrees, the unit can still be used, but should be sent for service as soon as practical.

Calibrating the unit

The RD-MP can function in two modes – calibrated and non-calibrated. The mode is shown briefly when the unit is powered on. A calibration procedure, which will allow you to switch the unit between the two modes, and to calibrate it if the calibrated mode is desired, can be accessed by following thes series of steps:

1) Make sure the RD-MP is cooled close to room temperature.

2) Unplug the device from the wall outlet, and then plug it back in.

3) Press the “FASTER” button, and without releasing it, also press the “ON” button.

4) The screen will show the “Calibration points: 2” message. You may now release the FASTER and ON buttons.

5) You may now adjust the number of calibration points by pressing the FASTER button to increase, and SLOWER to decrease. An attempt to decrease the number of calibration points below 2 will result in the message “Calibration points: No,” and will set the unit to non-calibrated mode. The maximum number of calibration points available is 5.

6) If the RUN button is pressed when the “Calibration points: No” message is displayed, the calibration procedure will end, and the device will function with factory default calibrations (“non-calibrated mode”).

7) If the RUN button is pressed when the “Calibration points: 2-5” message is displayed, the next calibration step will be presented. You will be prompted to enter the melting point values of the standards you are planning on using, the number of which is the number of calibration points you previously specified.

8) The message “Calibration point 1: 60.0” will appear. Pressing the FASTER and SLOWER buttons will increment/decrement the melting pont value. Pressing RUN will proceed to the next calibration point.

9) PLEASE NOTE: calibration points need to be entered in sequence from the lowest to the highest melting point.

10) After all points are entered, pressing RUN again will allow you to begin the physical calibration process. The message “CalOff [point number] ([user set value])” where [point number] is the calibration point number that is currently being measured (1 through 2-5) and [user set value] is the melting point value for that sample that you previously specified will appear in the first line. The second line will contain three temperature values that are being measured by the three temperature sensors of the RD-MP.

11) You will now be able to perform a standard melting point experiment for the given sample, using the FASTER/SLOWER/RUN buttons as you normally would. When running the experiment, the message “CalRun”

will appear as opposed to “Run” and “CalOff” instead of “Idle.”

12) When your standard melts, press and hold the SLOWER button and press the FASTER button. When the unit beeps twice, the first calibration point will be set in the memory, and you may release the FASTER and SLOWER buttons. The “CalOff [point number] ([user set value])” will appear again, with the [point number] incremented by one, and the [user set value] updated to the next standard's entered melting point.

13) You may now repeat steps 11 and 12 for each standard. If you ever wish to return to a previous standard and repeat the melting experiment, press and hold the SLOWER button first, and then pressing the FASTER button will allow you to cycle through the [point number]s.

14) After the last point is set, pressing the RUN button will show the “Calibration saved” message briefly, and the unit will then switch to normal operation. All of the calibration results will be automatically utilized, and will be recorded to the unit's non-volatile memory.

For the best results, it is encouraged to use as many calibration points/standards as possible, with widely distributed melting point values.

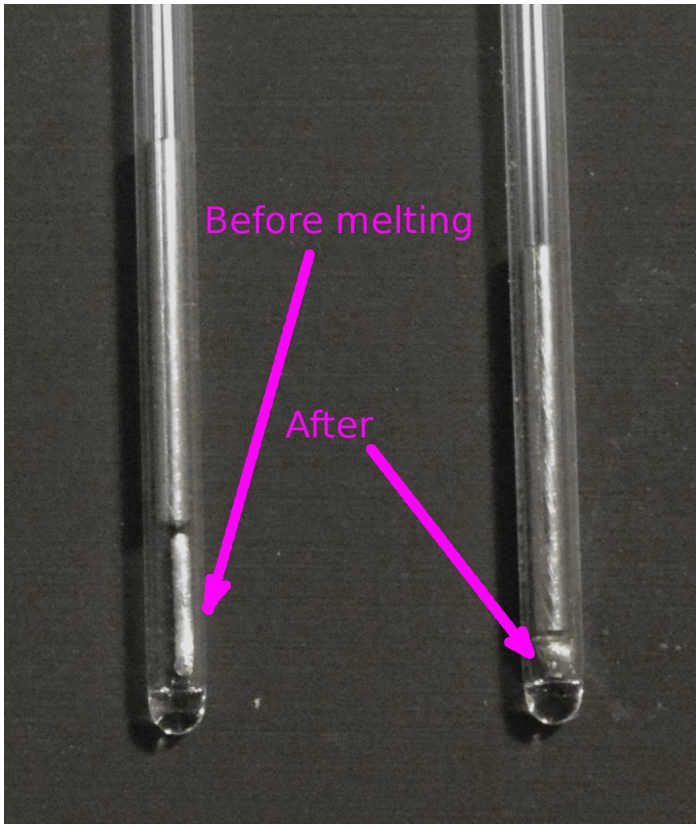
Safety

When using electrical equipment, basic safety precautions should always be followed:

- Do **not** pour **any** liquid (water, organic solvents, etc.) over the heating block or whole apparatus to aid accelerated cooling. Do not submerge or partially submerge the unit in liquid. A short circuit or fire may result.
- Do not insert capillaries containing explosive samples or pyrophoric materials (e.g. white phosphorus) for analysis.
- Use the melting point determination apparatus in an open area with 4-6 inches of well-ventilated space on all sides for air circulation. Do not allow the apparatus to touch or be covered with flammable or combustible materials.
- The sample holder of the unit (front aluminum/stainless steel) will become hot during usage. Do not touch hot surfaces.
- Do not operate unattended. **Never leave the apparatus unattended when plugged in.**
- Do not place the apparatus on or near hot surfaces, liquids, gasses, or open flames.
- Do not use the apparatus where flammable liquid, vapors, or aerosol (spray) products are being used, or in oxygen-enriched atmospheres.
- Do not let the cord hang over the edge of bench or table or touch hot surfaces.
- Do not place or store the apparatus where it can fall or be pulled into a liquid container or a free pool of liquid.
- **Do not reach for the apparatus that has come into contact with or fallen into water or any other liquid.** Please follow pertinent lab safety rules in this event.
- Never operate the device if it has a damaged cord or plug, is not working properly, has been dropped or damaged, or has been immersed in liquid. In these cases, return the melting point determination apparatus for examination and electrical or mechanical repair.
- Always unplug the apparatus from outlet after using. Allow to cool before storing or cleaning.
- Keep the device away from children.
- Do not use the melting point determination apparatus other than for the intended use.

Indium and Tin standards

High purity indium (156.6ºC, green top) and tin (231.9ºC, red top) sealed standards are included with RD-MP.



Please note that these standards consist from a tin/indium wire chunks weighted with a steel pin. The pin is needed because without it the high surface tension of molten metals make it difficult to judge when the melting has occurred.

With a steel pin the melting point is easily observed as the wire collapses to a droplet of metal and pin moves down.

Please see the photo above for further reference.

Warranty

During the one year of limited warranty, a factory-defective RD-MP unit may be exchanged free of charge (shipping cost included) for a new or refurbished unit of the same model. The Customer is only responsible for the return shipping costs. The following events will void the warranty:

The unit was directly exposed to fire or liquid, was flooded or bears signs of severe mechanical impact

Any of the above safety precautions was/were violated

The unit was opened and altered inside