



# MiniTherm™ Plus

Instructions for Use

MiniTherm Plus: Part # 720597

*MiniTherm Plus Instructions for Use  
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Made in Japan



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## Safety Warnings

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- This device is for research use only.
- Please read all instructions before using this device.
- If the device is used in a manner other than specified safety cannot be assured and may result in damage to the device which will not be covered under warranty.

### Safety Symbols Used in the Publication

These warning promote safe and correct usage and help avoid dangerous situations.

Symbol	Definition
	Injury or damage to equipment is possible
	Must not be done
	Must be done
	Electric shock is possible

### Shipping Precautions

-  Only ship in provided packaging and handle the device with care.
-  Keep box upright during shipping.
-   Keep the unit free from moisture during shipping.
-  Do not put heavy objects on top off the box.

## General Usage and Storage Precautions



Do not use near flammable or corrosive gas or oil mist that can damage electrical insulation.



Do not use in areas of intense vibration



Do not use near high voltage lines (inductive interference).



Do not place where condensation or dust is present



Do not place in direct sunlight.



Do not place heavy objects on the device.



Do not use near a heat source or combustible material as abnormal temperature control or fire may result.



Do not use outside the designated use and storage environments.



Do not apply excessive force to the glass plate as glass may break.



In case of glass breakage, do not touch the broken glass. This could result in injury or shock.



Avoid touching the glass as much as possible. Doing so may cause abnormal heating or another malfunction.



Do not handle the device with wet hands. It may cause damage to the electrical component.



Do not touch the electrical contacts (e.g., the connector on the plate cable).



Do not modify the equipment or disassemble the parts.

# Components and Overview

The box should contain one of each of the following components.

<p>MiniTherm Plus Heating Plate</p>	 A rectangular black heating plate with a white label that reads "MiniTherm Plus" and "MINITHEM MICRO". A black cable is connected to the top, and a small black sensor probe with a white label "XXXXXX" is attached to the bottom.
<p>MiniTherm Plus Controller Unit</p>	 A white, handheld controller unit with a small LCD screen and several buttons. The top of the unit has the text "MINITHEM PLUS" and "MINITHEM MICRO".
<p>Temperature Validation Slide</p>	 A long, thin, black rectangular slide with a green edge on one side.
<p>AC Power Adapter and Power Cord</p>	 A black AC power adapter with a power cord and a power cord with a different plug.
<p>Dual Lock Strips (2 sets) <i>Note: 1 set may already be installed on CEROS microscope.</i></p>	 Two sets of blue dual lock strips. One set is a long strip with many small holes, and the other is a shorter strip with fewer holes. A white label with "3M Dual" is visible.

## MiniTherm Plus Heating Plate

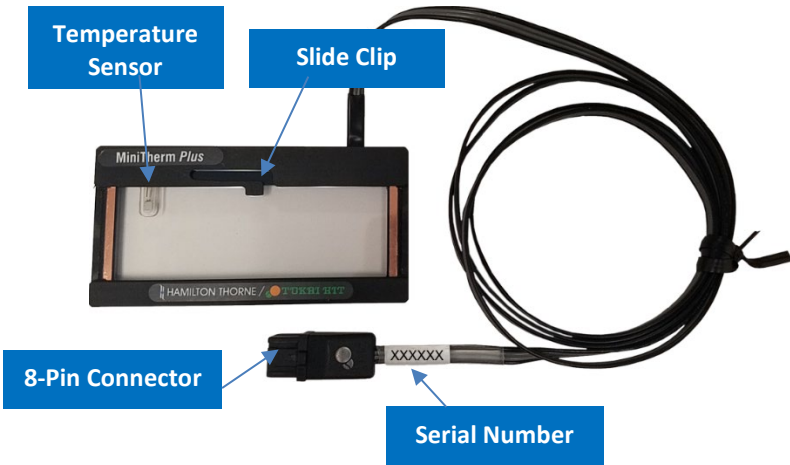


Figure 1. MiniTherm Plus Heating Plate

## MiniTherm Plus Controller



1. SET Key
2. SHIFT Key
3. ON / OFF Key
4. DOWN Key
5. UP Key

Figure 2. MiniTherm Plus Controller Unit



### Back of Controller



Figure 3. Controller Ports

1. Plate 1 8-pin port for MiniTherm Plus Heating Plate cable
2. DC IN 3-pin port for AC Power Adapter cable

### Bottom of Controller

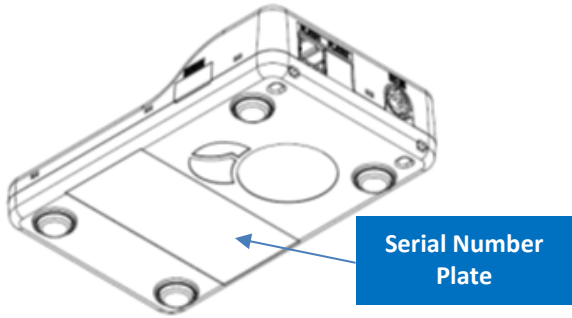


Figure 4. Controller Bottom

### Serial Number Plate

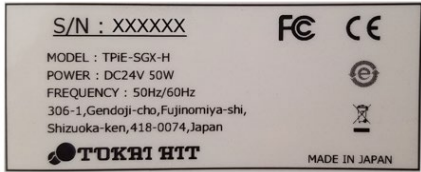


Figure 5. Serial Number Plate

# Installation

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## Installation Precautions



Install this device only according to the Instructions for Use in this booklet.



Use only the supplied AC Adapter and cables. Using an inappropriate voltage might result in equipment damage.



Make sure the serial number of the MiniTherm Plus heating plate (on the cable) matches that of the controller unit (underneath).



Use an uninterruptable power supply (UPS) to avoid equipment shut down during a power outage.



Use caution when rotating the microscope turret; you do not want the objective lens hitting the glass plate.



Do not let air flow directly over the MiniTherm Plus heating plate surface.



For best results, the recommended room temperature is  $25^{\circ}\text{C} \pm 2^{\circ}\text{C}$  ( $77^{\circ}\text{F} \pm 4^{\circ}\text{F}$ ). If used outside of this range, PID calibration may be required (*see page 13*).

## Cable Attachment

1. Place the MiniTherm Plus heating plate on a flat surface.
2. Confirm that the serial number on the bottom of the controller (see *Figure 4* and *Figure 5*) matches the serial number on the heating plate cable (see *Figure 1*).
3. Insert the 8-pin connector of the heating plate cable into the 8-pin port labeled Plate 1 on the back of the controller (see *Figure 6*). It should snap in place. (Please note: When disconnecting the cable, depress the snap clasp and pull gently.)
4. Connect AC Power Adapter cable, with the flat side facing up, to the 3-pin port labeled DC IN on the back of the controller unit (see *Figure 6*). Insert firmly until it locks into place.



*Figure 6. Cable connections*

5. Connect the power cord to the AC Power Adapter.
6. Plug into uninterruptable power supply.

## Installing on Microscope

The MiniTherm Plus sits on top of the microscope stage between the standard stage clamps. To prevent the MiniTherm Plus from lifting out of place, the cable must be secured using the Dual Lock® strips. (Note: If the MiniTherm Plus was purchased with a CEROS II CASA system, the strips may already be attached to the microscope stage.)

1. With the MiniTherm Plus on the stage between the stage clamps, position the cable to the back, right of the stage clamp.
2. Peel off the adhesive backing on one of the Dual Lock pieces and attach under the cable.
3. Place the non-adhesive Dual Lock strip on top and press down firmly to snap in place.








*Figure 7. Dual Lock Strips Securing Cable*

# Controls, Display and Work Flow Overview

## Controls



Figure 8. Display Controls

	SET KEY	Functions as Enter button and used to start the PID Calibration process
	SHIFT KEY	Shifts the screen to the next available display option. When used with SET provides access to Key Lock setting
	DOWN KEY	Decreases the setting value (SV) of the target temperature and used to set Key Lock
	UP KEY	Increases the setting value (SV) of the target temperature and used to set Key Unlock
	ON / OFF KEY	Turns the MiniTherm Plus Controller ON and OFF.

## Display Readout

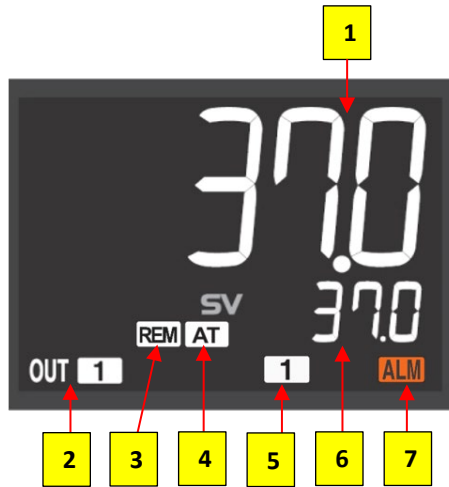
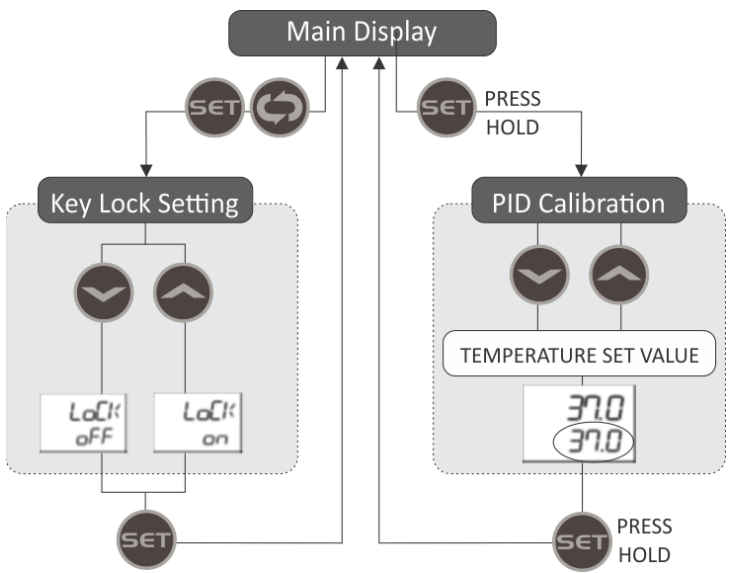
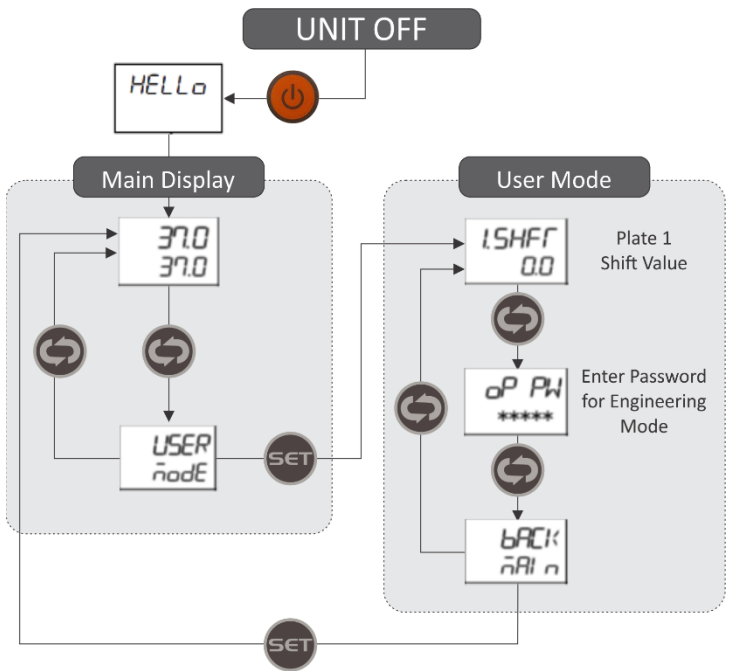


Figure 9. Display Readout

1	Processed Value (PV)	The current temperature of the heating plate
2	OUT & #	Indicates that the controller is outputting to the specified Plate #
3	REM	Not available in MiniTherm Plus
4	AT	Blinking AT light Indicates PID Calibration is in process
5	CH	Channel light indicates the currently selected plate
6	Set Value (SV)	The temperature setting value
7	ALM	Indicates an error has occurred

# Work Flow



## Initial Start Up

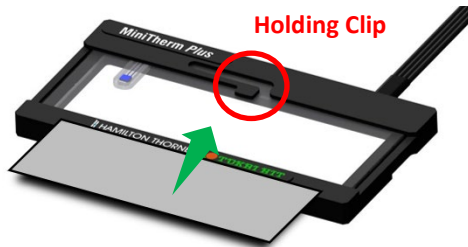
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### Start Up

1. Press the ON / OFF key. Heating will begin immediately.
2. Using the UP / DOWN keys, adjust the Set Value temperature to the desired level. The MiniTherm Plus temperature will stabilize in a few minutes.
3. Perform temperature validation (see below).

### Inserting and Removing Slides

When inserting a slide, install it from the front so that the MiniTherm Plus holding clip presses against the slide.



*Figure 10. Inserting a Slide*

When removing a slide, pull it out from the side.



*Figure 11. Removing a Slide*



## Temperature Validation

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The MiniTherm Plus includes a Temperature Validation Slide. This slide has a thermo-sensitive coating with a liquid crystal layer. This coating turns green at a temperature of  $37^{\circ}\text{C} \pm 0.5^{\circ}\text{C}$ . Temperatures below this result in a brown coloration while temperatures above this range turn the coating blue.



*Figure 12. Temperature Validation Slide Color Change*

1. Make sure the temperature Set Value and Processed Value each show  $37^{\circ}\text{C}$ .
2. Place the Temperature Validation Slide on the MiniTherm Plus.
3. If the color of the Temperature Validation Slide turns green, no further steps are required. If the color is blue or brown, refer to PID Calibration Process (see page 13) and Temperature Shift Value (see page 14).

*Note: Temperature may also be validated using a thermometer (NIST Traceable) that has a small and thin probe tip.*

## PID Calibration Process

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This system adopts PID (Proportional, Integral, Derivative) control for stable temperature control. The MiniTherm Plus controller is calibrated under the environment of room temperature  $25^{\circ}\text{C} \pm 2^{\circ}\text{C}$  ( $77^{\circ}\text{F} \pm 4^{\circ}\text{F}$ ) before shipping. If the temperature of the heating plate is not stable in your usage environment, the controller can provide the

optimum parameters based on your environment by performing PID calibration.

- Press and hold the SET key to initiate PID calibration.
- The AT light on the display will blink while calibration is in process and the Processed Value display will increase and decrease during calibration.
- Calibration is complete when the AT light stops blinking.

Once the PID Calibration is complete, recheck the temperature. If the measured temperature is still off from the Processed Temperature, a Shift Value can be entered (see below).

## Temperature Shift Value

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By entering a Shift Value (difference between the Processed Temperature on the display and measured temperature), the displayed temperature can be adjusted so that it matches the measured temperature.

### Determining Shift Value Using Temperature Validation Slide

1. Place the Temperature Validation Slide on the MiniTherm Plus and allow a few minutes for the slide to register the color change.
2. If the slide is brown, increase the Temperature Set Value using the Up key until the slide shows a consistent green color.
3. If the slide is blue, decrease the Temperature Set Value using the Down key until the slide shows a consistent green color.
4. Note the displayed Processed Value.
5. To determine the Shift Value, subtract the noted value from 37. For example, if the noted Processed Value is 38.5, then the Shift Value would be -1.5.

$$37 - 38.5 = -1.5$$

### Determining Shift Value Using Thermometer

1. Enter the Set Value for the target temperature and allow MiniTherm Plus temperature to stabilize.
2. Measure the temperature of the MiniTherm Plus heating plate with NIST traceable thermometer.

- To determine the Shift Value, subtract the measured value from the Process Value. For example, if the noted Processed Value is 37 and the measured value is 38.5, then the Shift Value would be -1.5.

$$37 - 38.5 = -1.5$$

### Entering the Shift Value

- From the Main Display, press the SHIFT Key to bring up User Mode option.
- Press the SHIFT key again to bring up Plate 1 Shift Value.
- Using the UP or DOWN key, enter the determined Shift Value. Make sure that a negative shift value shows a “minus” sign (see Figure 12).
- Press the SHFT key 2 times to bring up the Back to Main option.
- Press the SET key to accept the entered Shift Value.



Figure 13. Negative Shift Value

## Key Lock Setting

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To prevent an accidental change in the Setting Value temperature, at Key Lock may be set.

1. From the Main Display, press the SHIFT and SET Keys to bring up Key Lock option.



2. To turn the Key Lock on, press the UP Key



3. To turn the Key Lock off, press the DOWN Key.



4. Press the SET key to accept the Key Lock status.



## Troubleshooting

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The ALM light will appear on the Main Display when a problem is detected. When the ALM appears, stop using the MiniTherm Plus immediately and try to determine the cause.

Error	Condition	Restoration Method
Abnormal heating detection	The heating plate sensor does not detect temperature elevation when the OUT light is ON	Immediately turn off the controller and check if there is abnormality on the Heating Plate. If abnormality is found, DO NOT use the plate and contact customer support.
	The heating plate sensor detects temperature elevation when the OUT light is OFF	In case of false detection, it will recover by turning on the power again.
Controller circuit fault	A problem or error is detected during the automatic internal circuit check.	Turn controller OOF and then back ON again. If ALM light still on, contact customer support.

Error	Condition	Restoration Method
Abnormal temperature detection	The sensor detects that the temperature of the heating plate falls out of the specified range.	Turn controller OOF and then back ON again. If ALM light still on, contact customer support.
Controller voltage fault	Digital power supply voltage inside the controller drops below a certain value.	Turn controller OOF and then back ON again. If ALM light still on, contact customer support.
Controller timer fault	The controller cannot execute necessary processing within a certain period.	Turn controller OOF and then back ON again. If ALM light still on, contact customer support.
Controller display fault	An error in the controller circuit board results in an error in device communication.	Turn controller OOF and then back ON again. If ALM light still on, contact customer support.

## Customer Support

In USA, please contact Hamilton Thorne for service and support at:

- Email: [support@hamiltonthorne.com](mailto:support@hamiltonthorne.com)
- Phone: (800) 323-0503 or (978) 921-2050
- Fax: (978) 921-0250

For international customers, please contact your Hamilton Thorne distributor or Tokai Hit at:

- Email: [solution@tokaihit.com](mailto:solution@tokaihit.com)
- Phone: 0544(24)6699
- Fax: 0544(24)6641

## Maintenance

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### Maintenance Precautions



Do not apply excessive force to the glass plate as glass may break.



Turn off power supply while performing maintenance.



Do not use volatile materials such as benzene or thinner for cleaning. Use of such materials will discolor and/or damage key device surfaces.



Do not use organic solvents or water to wash the unit.



Do not scrape strongly during cleaning.

- Clean device with soft, lint free cloth using small amount of diluted neutral detergent.
- Wipe gently with a dry lint free cloth.

## Specifications

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### General Specifications

Dimensions & Weight	MiniTherm Plus Plate Heater: 84mm x 47mm x 6mm 3.31in x 1.85in x 0.24in 31g (1.1oz) MiniTherm Plus Controller Unit: 132mm x 82mm x 35mm 5.20in x 3.23in x 1.38in 151g (4.85oz)
Power Source	100-240VAC
Current Rating	1.6A
Max Power Consumption	50W

## Temperature Control

Method	PID Control
Increments	0.1°C
Setting Method	Digital switch using Up / Down Keys
Max. Temperature Setting	60.0°C
Min. Temperature Setting	0.0°C
Controllable Temperature	Ambient +5°C ~ 60.0°C
Temperature Accuracy	Within 0.1°C (under optimum use conditions)
Sensor	Platinum resistance thermometer (Pt 100 Ω)

## Power Cord

For use in areas with 110V-120V power	<p>Use only power Supply Cable described below: Detachable cord set, 3-conductor grounding type, AC 125V7A minimum, listed in UL.</p> <p>In case of using with extension cord, use only Power Supply Cord with protective earth (grounded) wire.</p>
For use in areas with 2200V-2400V power	<p>Use only 3-pole Power Supply Cable, with plug and outlet complying with EU/EN standards in EU territory. Class 1 equipment must be connected to protective earth (grounded) terminal.</p> <p>In case of using with extension cord, use only Power Supply Cord with protective earth (grounded) wire.</p>

## Use Conditions

Location	Indoor use only
Temperature	25°C ± 2°C
Relative Humidity	5 ~ 70% (no condensation)
Altitude	Up to 2000m maximum
Environment Conditions	Installation category II of IEC60664-1, Pollution degree 2

## Storage Conditions

Temperature	10°C to 50°C
Relative Humidity	5 ~ 70% (no condensation)
Altitude	Up to 2000m maximum

## Warranty, Service Information, Returns and Limitation of Liability

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### Warranty

Hamilton Thorne (“HT”) warrants that its products shall be free from defects in material and workmanship and will perform in accordance with HT published specifications under normal use for a period of two years, from the date of installation. This warranty does not cover lost parts and shall not apply to damage to the Equipment resulting from abuse, negligence, accident or loss due to fire, flood, theft, power fluctuations, lightning strikes, off-label use, user directed system and any other damages covered under Distributor’s or final user’s Insurance Policy, or damage in transit. The warranty may be voided should the Buyer attempt any repairs outside the normal service described in the manual, alterations or additions, without prior written permission of HT.

### Service Information

During this warranty period, HT will, at no cost, repair or replace any defective equipment returned to HT. Transportation charges to return the equipment to HT will be prepaid by the sender. The shipping method and packaging are critical to the repair process. Consult HT before shipping. When the Buyer requests expedited shipping or special handling, the Buyer shall pay any associated charges.

HT provides Software Maintenance which includes updates to software such as patches and reliability enhancements during the warranty at no charge. The warranty does not include major software upgrades.

Backup all files before returning the equipment for repair or replacement. HT recommends that you have an external back-up system at all times to reconstruct lost or altered files, data or programs. HT IS NOT RESPONSIBLE FOR ANY LOSS OF DATA.



## Returns

A Return Authorization Number must be obtained before returning any product to HT. Please call 1-800-323-0503 in the U.S., 1-978-921- 2050 outside of the U.S., your local distributor or email [support@hamiltonthorne.com](mailto:support@hamiltonthorne.com) for this Return Authorization Number. When calling or contacting HT, please have the serial number of your system available.

## Limitation of Liability

HT makes no other warranty, expressed or implied, and HT disclaims any implied warranty of merchantability or fitness for a particular purpose.

The Buyer and HT agree that the sole and exclusive remedies for breach of any warranty concerning the goods shall be repair or replacement of defective parts upon the terms above described or, at HT's discretion, refund of the purchase price. HT shall not be liable for contingent or consequential damages to persons or property, and its sole liability is as above set forth. Any action by the Buyer for any alleged breach of the warranty set forth herein shall be brought to the attention of HT by the Buyer within the warranty period, but not later than 30 days after the alleged breach.

This statement of warranty and limitations of liability is a complete and exclusive statement of all warranty and liability representations of HT. It may not be varied, supplemented, qualified or interpreted by any prior dealings between the parties or by any usage of the trade or upon the face or reverse of any form to which this is attached or a part of, nor may it be modified by any agent, employee or representative of HT unless such modification or representation is made in writing and signed by a duly authorized officer of HT.

Repairs and/or replacement under the terms of this warranty shall not extend the warranty life of the original equipment supplied. All repairs and service must be performed by HT service engineers or by an authorized representative.







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