Heat Cool Thermal Mixer II
&
Heat Only Thermal Mixer II

Operating Instructions

Model 270800
&
Model 270900

Table of Contents

1. Safety

The following symbols mean:-

Caution: Read these operating instructions fully before use and pay particular attention to sections containing this symbol

Caution: Surfaces can become hot during use.

Always observe the following safety precautions

- Use only as specified by the operating instructions or the intrinsic protection may be impaired.
- After transport or storage in humid conditions, dry out the unit before connecting it to the supply voltage.
- As the unit is producing shaking or rotational movement, be aware of the surface that the unit will be placed upon.
- Connect only to a power supply with a voltage corresponding to that on the serial number label.
- Ensure that the main switch and isolating device (power supply connector) are easily accessible during use.
- Before moving, disconnect at the power supply socket.
- If liquid is spilled inside the unit, disconnect it from the power supply and have it checked by a experienced person.
- It is the user's responsibility to carry out appropriate decontamination if hazardous material is spilled on or inside the equipment.
- Before using any cleaning or decontamination method, except those recommended by the manufacturer, user should check with the manufacturer that the proposed method will not damage the equipment.
- Clean the unit only with a damp cloth; do not use chemical cleaning agents.
- Place unit on a solid, level work surface or laboratory bench

2. General Information

The Boekel Heat Cool Thermal Mixer II is designed for shaking and controlling a set temperature in a range from 15ºC below ambient to 99ºC in 0.5, 1.5, 2.0, 5.0 ml micro test tubes, cryogenic tubes, conical bottom tubes, Standard/Deep well micro-titre plates and PCR tubes/plates.

This device can be used for any temperate sensitive reaction including:

- Labeling of nucleic acids
- Growth and Transformation of bacteria
- Warming/Cooling of buffers
- Production and purification of proteins
- Incubation of Elisa plates

In addition to the controlled temperature mixing function of the Heat Cool Thermal Mixer II, the unit also has multi-step and mode capability. This capability can be viewed and configured from the list menu or by scrolling through steps on the Home screen.

3. Getting Started

3.1 Unpacking

Remove packing materials carefully, and retain for future shipment or storage of the unit.

The Boekel Scientific Heat Cool Thermal Mixer II includes:

- Thermal-mixer …….....1 piece
- External Power Supply .....1 piece
- Accessory Block for 24 x 1.5 microtubes ……..……..1 piece
- Operating Instructions……..…….....1 copy

3.2 Instrument Placement

Place the Heat Cool Thermal Mixer II on a solid level surface so that there is at least 10 cm of clearance from adjacent walls and devices and that the ventilation slots on the side of the unit are free from obstruction.

Connect the Heat Cool Thermal Mixer II to the AC/DC adapter and the adapter to the power supply

Switch the unit to the on position utilizing the power on/off switch located on the rear left side of the instrument.

4. Operation

4.1 **Home Screen Navigation (Figure 1) –** Navigation and Screen Overviews

The system has been designed to be easy to use and easy to navigate. Below is an overview of the system menus and screens accessed from the home screen. A detailed description of each of these screens is provided in this manual.

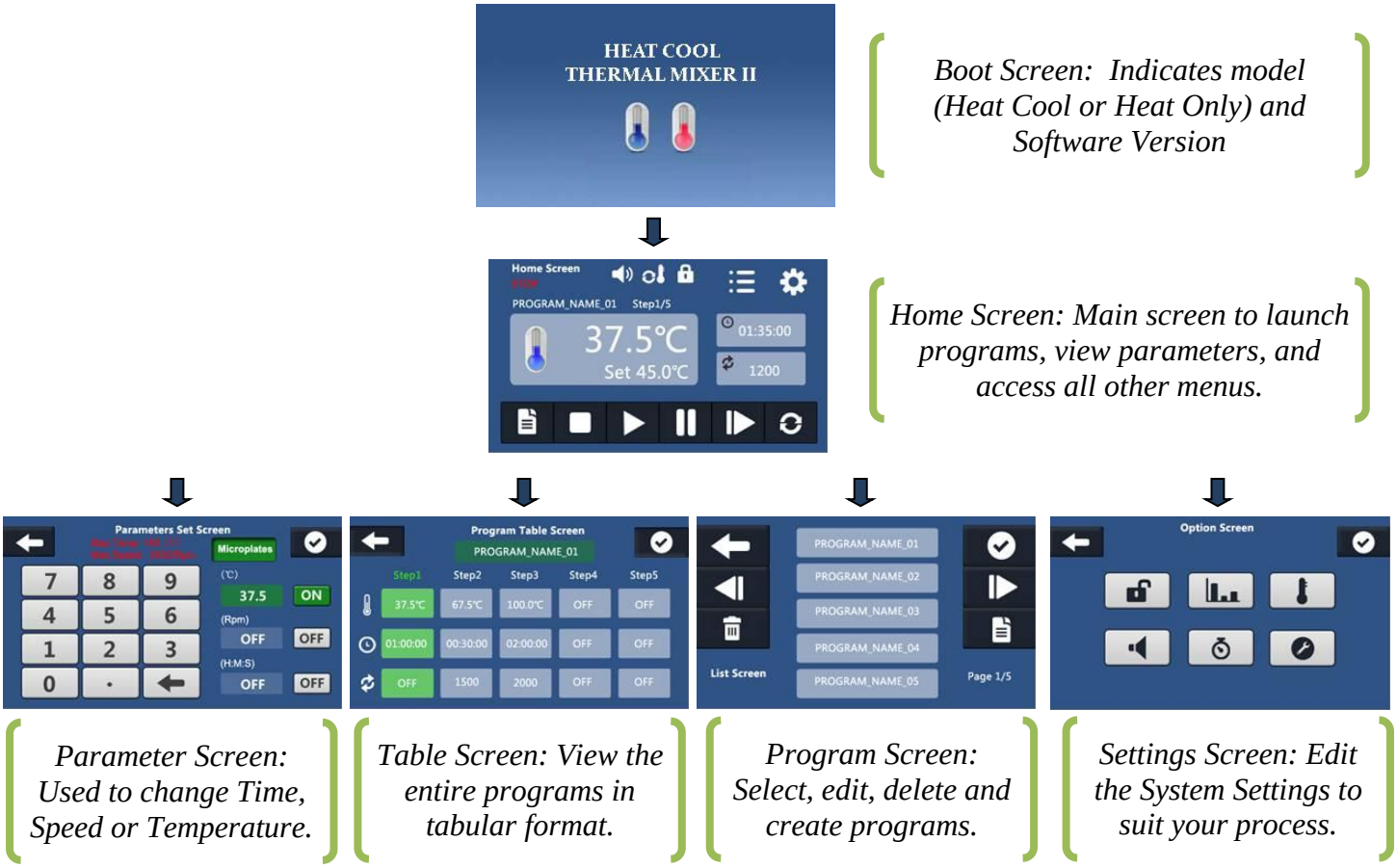
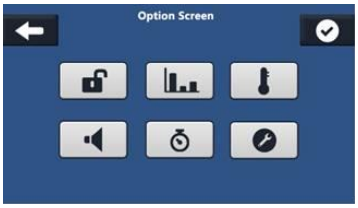


Figure 1

4.2 **Options Screen Navigation (Figure 2) –** Navigation and Screen Overviews

Below is an overview of the system menus and screens accessed from the Settings Screen.



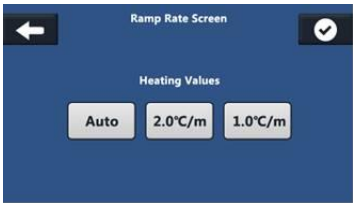
Options Screen: Edit the System Settings to suit your process.

Mode Screen: Change the timing, temperature and mixing settings

Calibration Screen: Walks the user through a 4 point calibration

Parameter Lock: Set the parameter lock to password protect settings

System Reset: Reset the system to factory default settings



Ramp Screen: Change the heating ramp rate

Figure 2

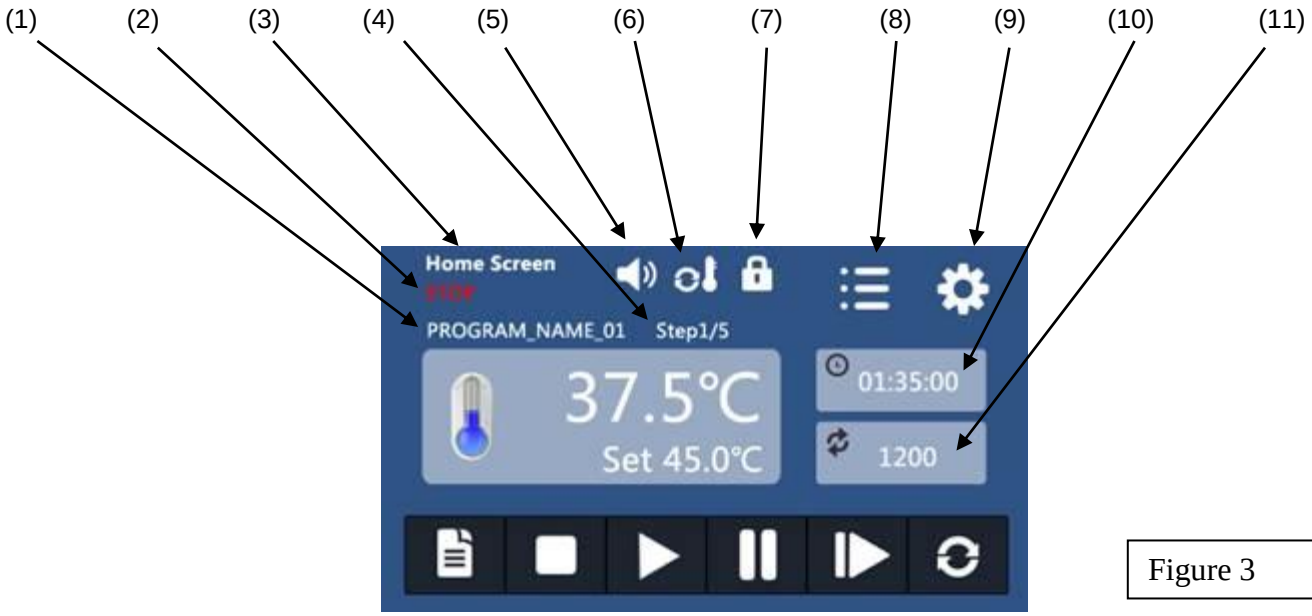


Figure 3

4.3 Home Screen (Figure 3) – The home screen displays all operating parameters and allows for access to menus to configure the unit

(1) Program Name – displays the name of the program that is launched
(2) System Information – displays information about the unit while in operation
(3) Screen Name – name of screen for reference
(4) Step Number – indicates the step number executed and in total
(5) Speaker Icon – indicates if sound is turned on/off. The unit will beep after each step, and when a program is complete
(6) Timer Mode Icon – indicates what mode the unit is operating in
    a. Time counting begins immediately
    b. Time counting and agitation begins when the unit reaches the set temperature
    c. Agitation begins immediately and time counting begins when the set temperature is reached
(7) Parameter Lock – if the icon is visible a parameter lock has been enabled. The parameter lock does not allow changes to parameters without entering a user established passcode.
(8) Program List – pressing this will take you to the list of programs. From this menu programs can be launched, edited, or deleted.
(9) Settings Icon – this icon brings up the settings screen. The settings screen is for calibration, ramp rate, sound, system reset, system timers, and the parameter lock.
(10) Time Icon – indicates the time left in a step. Pressing this icon will enter the parameter set screen where the time can be edited.
(11) RPM's Icon – indicates the rotations per minute the unit is set to operate at. Pressing this icon will enter the parameter set screen where the RPM's can be edited.

4.3 Home Screen Continued (Figure 4) – The home screen displays all operating parameters and allows for access to menus to configure the unit

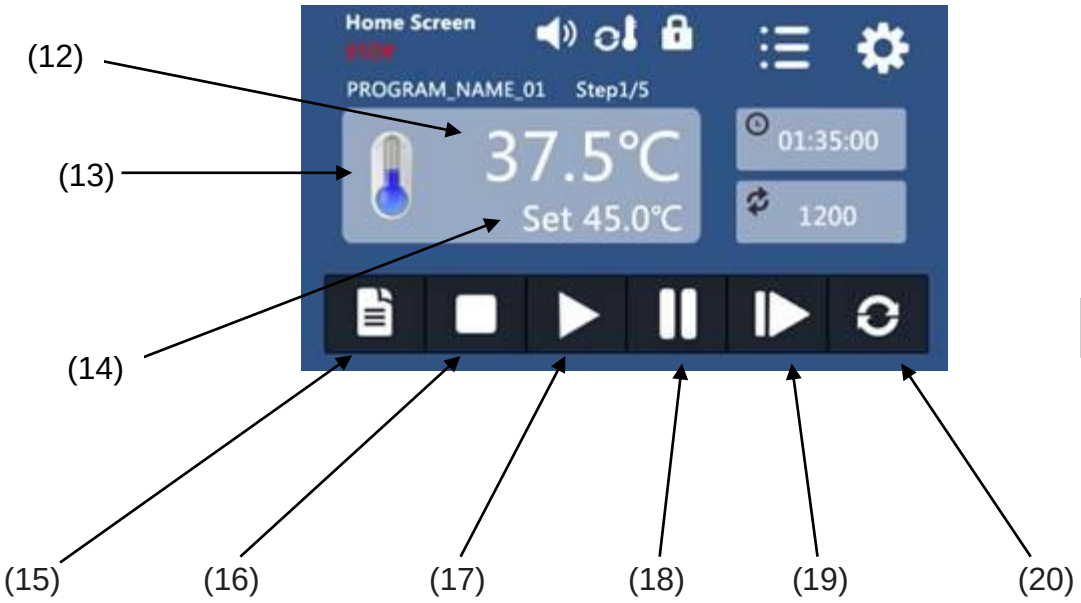


Figure 4

(12) Current Temperature – the current temperature of the samples in the block.

(13) Heating or Cooling Indicator – This pictorial will show whether the unit is heating or cooling to maintain the setpoint temperature

(14) Setpoint temperature – the target temperature the unit will try to maintain

(15) Program Setup – Displays temperature, mixing, and time settings in tabular format for all programmed steps

(16) Stop Icon – Stops running the current program

(17) Play Icon – Plays the program or current settings

(18) Pause Icon – Pauses mixing and timer, continues to maintain set temperature

(19) Skip Icon – Automatically skips to the next step

(20) Quick Mix – Press the quick mix to start immediately mixing to the set RPM's. Pressing the quick mix button again will stop the quick mix mode.

4.4 Parameter Set Screen (Figure 5) – The parameter set screen is access by pressing the time, temperature or RPM's on the home screen. It can also be accessed in the table view when changing parameters. This screen is used to modify parameters. Parameters cannot be modified without a passcode when the parameter lock is enabled.

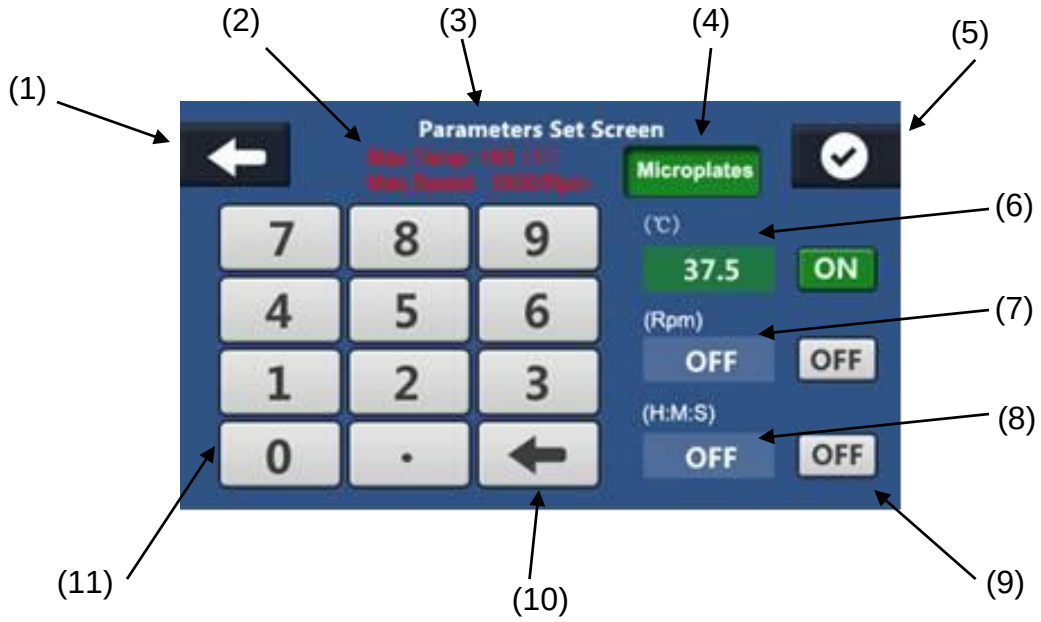


Figure 5

(1) Back Arrow – Returns to the previous screen without saving settings

(2) System Information – Displays minimum and maximum settings for the attached block

(3) Screen Name – Name of screen for reference

(4) Microplates Button – This button is to configure the settings based on the type of microplate. Different microplates have different maximum speed and temperature settings. This button only appears when the microplate block is in use.

(5) Confirm Check – Saves the changes made to the parameters and returns to the previous screen.

(6) Temperature Configuration – Touching this box allows for setting the temperature setpoint.

(7) RPM Configuration – Touching this box allows for setting the Rotations Per Minute setpoint.

(8) Time Configuration – This determines the run time for the mixing and temperature set points. Setting this value to off will cause the unit to run indefinitely. Timing is dependent on the system MODE setting.

(9) On/Off Button – Turns On/Off the ability to control a parameter. If all buttons are set to off the step is excluded

(10) Backspace Arrow – Deletes numbers entered for a parameter

(11) Number Entry Pad – Used to change the values of a parameter

4.5 Program Setup Screen (Figure 6) – The program setup is accessed from the Home screen and the Program List screen. This screen displays all parameter setpoints for an entire program and it can be set to continuously repeat a program. The setpoints and the program name can be edited from this screen.

Program Setup Icon

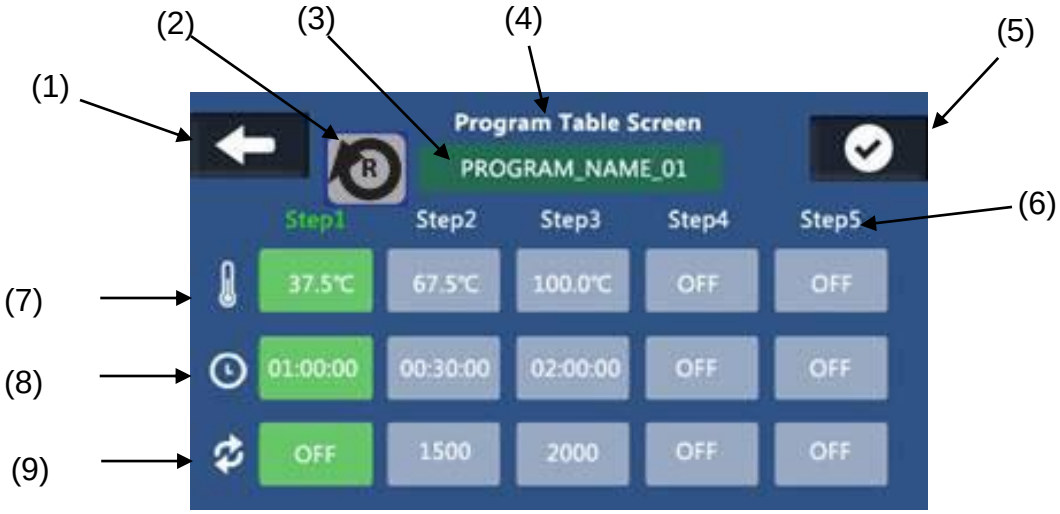


Figure 6

(1) Back Arrow – Returns to the previous screen without saving settings

(2) Repeat Button – Pressing this button will repeat the steps when the sequence is finished

   a. Gray Icon – Repeat is not active

   b. Green Icon – Repeat is active

(3) Program Name – Displays the program name for the steps. Touch this block to edit the program name.

(4) Screen Name – Name of screen for reference

(5) Confirm Check – Saves the changes made to the parameters and returns to the previous screen.

(6) Step Number – Indicates the step number for the parameters

(7) Temperature Row – Displays the temperatures for the steps of the program. Touching a box will bring up the Parameter Setup screen for a single step.

(8) Time Row – Displays the times for the steps of the program. Touching a box will bring up the Parameter Setup screen for a single step

(9) RPM Row – Displays the Rpm's for the steps of the program. Touching a box will bring up the Parameter Setup screen for a single step

4.6 Program List Screen (Figure 7) – The program list screen is accessed from the Main Menu. This screen lets you view, edit, create, save and delete programs.

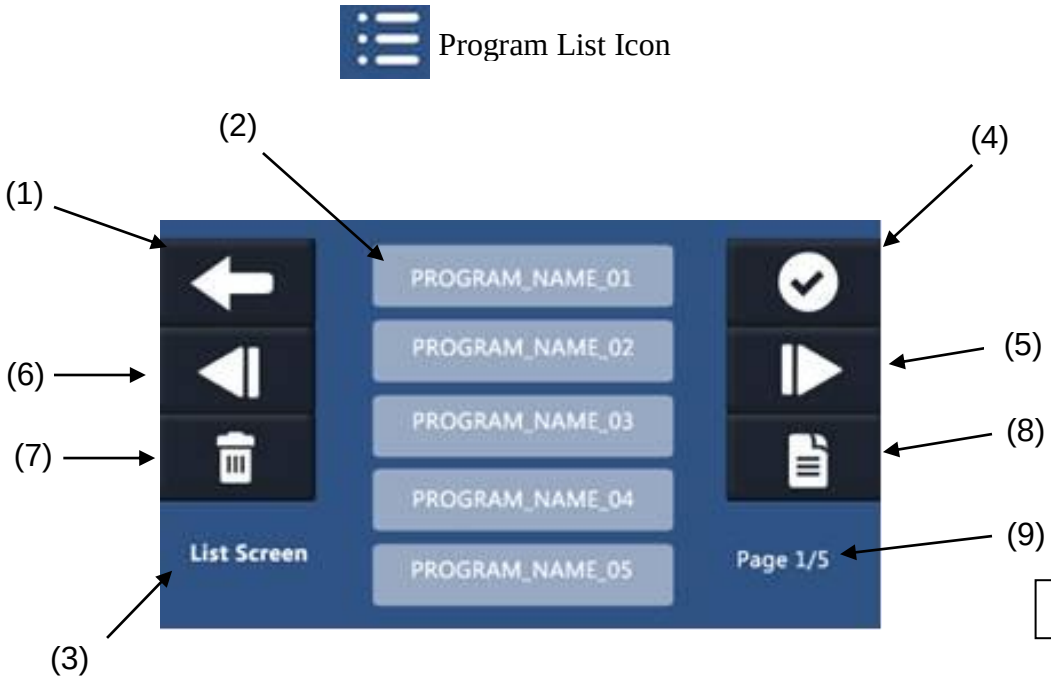


Figure 7

(1) Back Arrow – Returns to the previous screen without saving settings

(2) List of Programs – Displays five programs per page. The system stores up to 25 programs.

(3) Screen Name – Name of screen for reference

(4) Confirm Check – Saves the changes made to the parameters and returns to the previous screen.

(5) Page Forward – Skips to the next page of programs

(6) Page Backward – Skips to the previous page of programs

(7) Delete Program – Deletes an existing program. User will have to confirm this change.

(8) Program Setup – Displays temperature, mixing, and time settings in tabular format for all programmed steps

(9) Page Number – Indicates what page of programs is being displayed

Default Programs

There are preprogrammed programs placed on the unit when it is configured in the factory. These are just examples that can be overwritten. Below is a list of the preprogrammed programs.

#	Name	Repeat	Step 1	Step2	Step 3
1	DEMO1	Yes	Temp: 96C Time: 30s RPM: 300	Temp: 20C Time: 40s RPM: 500	Temp:68C Time: 60s RPM: 1000
2	DEMO2	Yes	Temp: 10C Time: 1 min RPM: 0	Temp: 30C Time: 1 min RPM: 300	Temp: 50C Time: 1min RPM: 1000
4	HEAT MIX	No	Temp: 80C Time: 5hr RPM: 500		
5	DENATURE	No	Temp: 95C Time: 30min RPM: 0		
4	INCUBATION	No	Temp: 37C Time: 24hr RPM: 1000		
5	RESTRICTION	No	Temp: 37C Time: 1hr RPM: 1000		
6	PROTEIN K	No	Temp: 56C Time: 5min RPM: 1000		
7	RNASE	No	Temp: 37C Time: 5 min RPM: 0		
8	REACTION	Yes	Temp: 96C Time: 30 sec RPM: 0	Temp: 60C Time: 30 sec RPM: 0	Temp: 68C Time: 60sec RPM: 0
9	PROGRAM1 (empty)	No	off	off	Off
10 - 25	PROGRAM 2-17 (empty)	"	"	"	"

4.7 Options Screens – The options screen is accessed from the Home Screen only. This menu is for advanced system configuration.

 Options Screen Icon

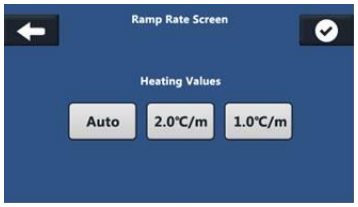
4.71  Parameter Lock

The parameter lock is used to protect unit settings. When a Parameter lock is initiated the user inputs a password and confirms the password. The user can select and run programs but no parameters can be changed until this password is entered again.

Parameter Lock Screen

4.72  Heating Temperature Ramp Rate

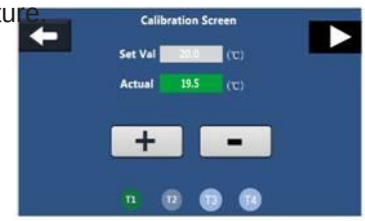
The unit cooling settings are fixed at the maximum possible level but the user does have the ability to change the heating ramp rate. The default value is approximately 5˚C per minute. There are two other options; 2˚C per minute and 1˚C per minute.



Ramp Rate Screen

4.73  Temperature Calibration

It is recommended that the unit is calibrated once a year and this figure is based on usage. The temperature calibration is a four point calibration. The user will use a calibrated sensor to input the actual temperature values. The unit uses 4 setpoints 20˚C, 40˚C, 60˚C, and 80˚C. (note: the “Heat Only” unit requires only 3 a setpoint calibration) Once the temperature has stabilized the user will enter the value that is displayed on their calibrated sensor. A temperature measuring device that is accurate within +/- 0.2° C is recommended. A green confirm button will appear to confirm the entry. The calibration cycle can take more than 30 minutes based on starting temperature and ambient temperature.



Temperature Calibration Screen

4.74  Speaker Settings

To adjust the speaker settings touch the speaker icon. If the speaker is turned on the unit will beep three times when a program is complete and once when a step is complete.

4.75  Timer Mode

The unit has three modes for timing, mixing and temperature control. These modes are:

a.  Time counting begins immediately

b.  Time counting and agitation begins when the unit reaches the set temperature

c.  Agitation begins immediately and time counting begins when the set temperature is reached

The user can select the proper mode in this menu to best suit their process.

Timer Mode Screen

4.76  Run Time & Factory Reset

The unit can be reset to its factory default settings. There is also an onboard timer to keep track of unit usage rate and service intervals.

Run Time & Factory Reset Screen

4.8 Mounting Interchangeable Blocks – The unit can easily be fitted with different blocks that are configured to accommodate different consumables.

To change the block:

1) Rotate the two locking tabs on the front of the block inward
2) Lift the front of the block upward slightly
3) Pull block away from unit

Block Clips Open

To put on a block:

1) Make sure the two locking tabs on the front of the block are rotated inward
2) Lift the front of the block upward slightly and slide the back into place
3) Lower the front of the block down
4) Spin the locking tabs outward to lock the block in place

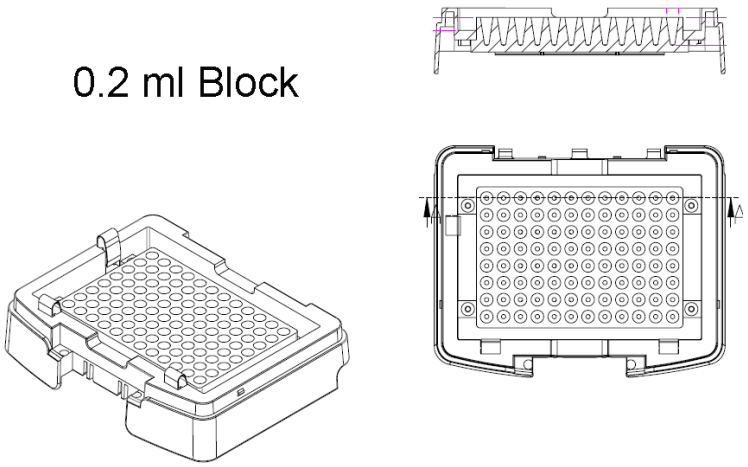
Block Clips Closed

The following Accessories are currently available:

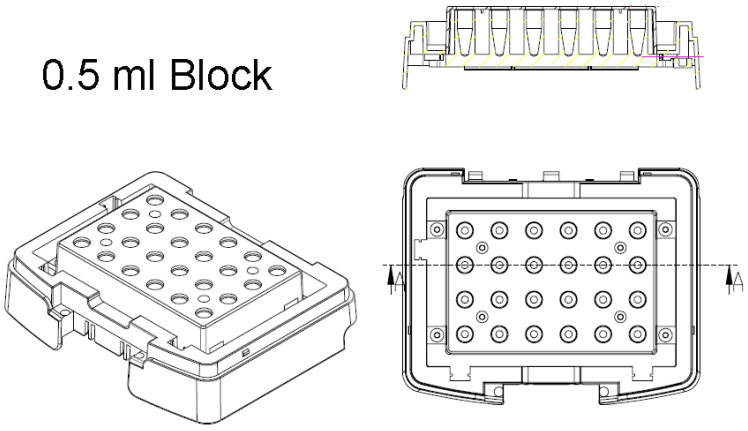
Accessory Heating/Cooling Blocks	
Description	**Boekel Part Number**
Block, 24 x 0.5ml Tubes	270810
Block, 24 x 1.5ml Tubes	270811
Block, 24 x 2.0ml Tubes	270812
Block, 8 x 5.0ml Tubes	270813
Block, 24 12mm Tubes	270814
Block, 24 Cryo Tubes	270815
Block, 8 x 15ml Conical Tubes	270816
Block, 4 x 50ml Conical Tubes	270817
Block, Standard and Deepwell Microplate	270818
Block, 96 Well PCR Plate	270819
Block, 384 Well PCR Plate	270820

Block Diagrams:

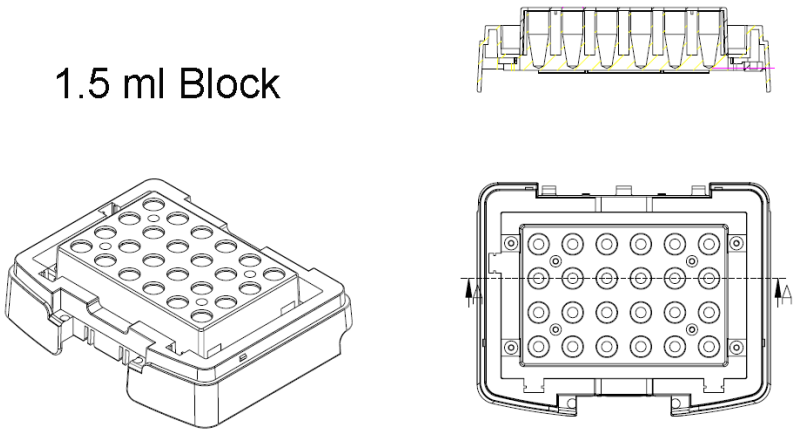
0.2 ml Block



0.5 ml Block

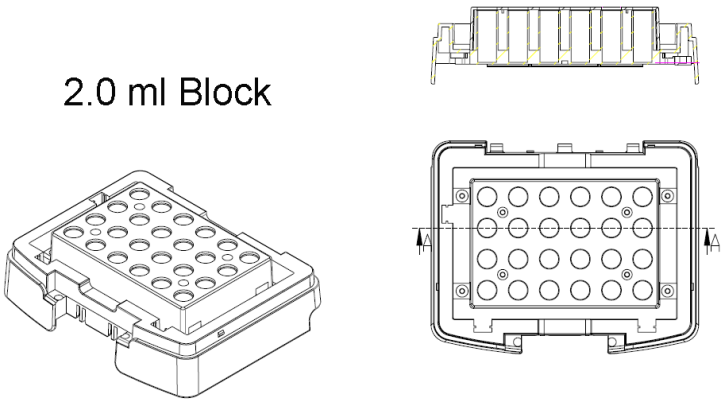


1.5 ml Block

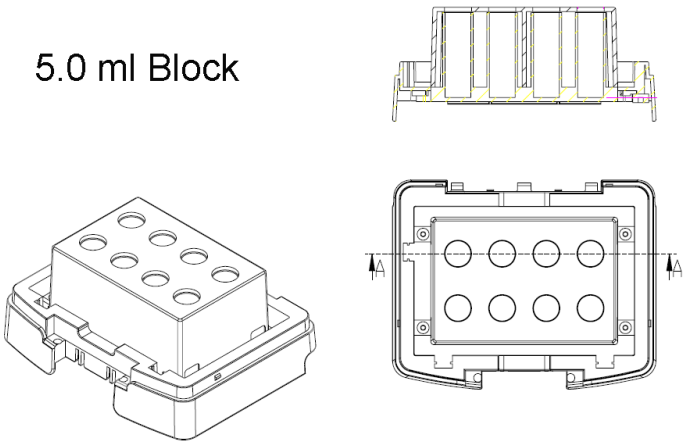


Block Diagrams: (cont.)

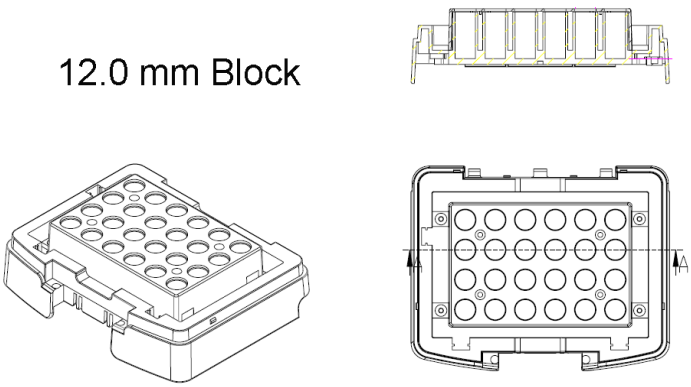
2.0 ml Block



5.0 ml Block

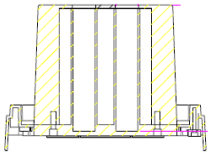


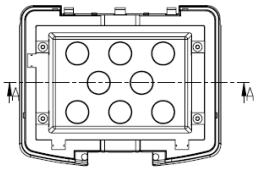
12.0 mm Block

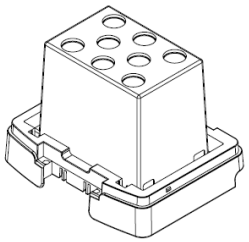


Block Diagrams: (cont.)

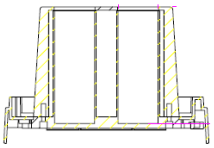
15 mL Block

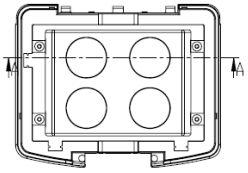


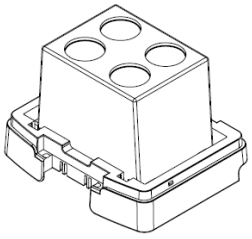




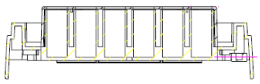
50 ml Block

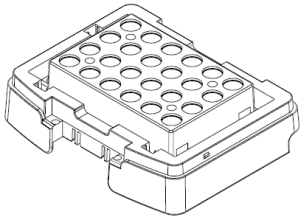


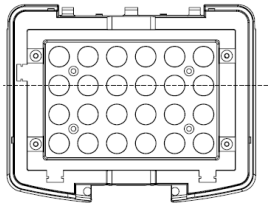




Cryo Tube Block

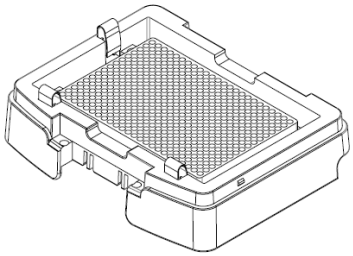


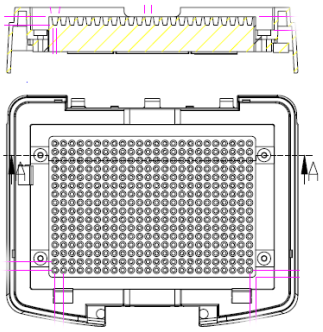




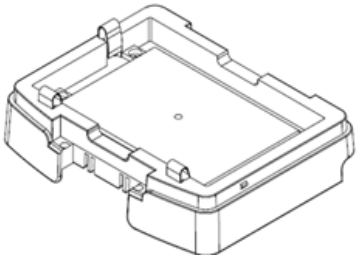
Block Diagrams: (cont.)

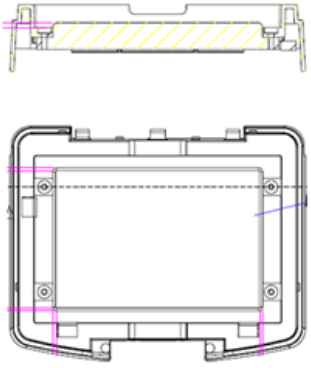
384 well Block





Microplate Block





5. Specifications

	Heat Cool Thermal Mixer II	Heat ONLY Thermal Mixer II
Model #:	270800	270900
Capacity	0.5ml tubes to 50ml tubes	0.5ml tubes to 50ml tubes
	(block dependent)	(block dependent)
Block Included with Unit	0.5ml x 24 tubes	0.5ml x 24 tubes
Dimensions W x D x H (in)	9 x 13 x 5.3	9 x 13 x 5.3
Dimensions W x D x H (cm)	23 x 33 x 13.5	23 x 33 x 13.5
Speed Range (rpm)	0, 250 to 3000	0, 250 to 3000
Speed Setting Increments (rpm)	50	50
Timer	0 – 99 Hours 59 Min 59 seconds / ∞	0 – 99 Hours 59 Min 59 seconds / ∞
Operation Temperature Range	10°C to 30°C	10°C to 30°C
Temperature Range	15°C below ambient to 100°C	Ambient plus 5°C to 100°C
Heat Up Rate (Selectable)	5°C/Min, 2°C/Min, 1°C/Min	5°C/Min, 2°C/Min, 1°C/Min
Cooling Rate (Fixed)		
Above Ambient	3°C/Min – 5°C/Min	Ambient Cooling
Below Ambient	0.5°C/Min – 1°C/Min	Ambient Cooling
Temperature Accuracy		
20°C to 40°C	+/- 0.2°C	+/- 0.2°C
< 20°C and > 40°C	+/- 0.5°C	+/- 0.5°C
Temperature Uniformity	±0.3°C (20°C to 40°C)	±0.3°C (20°C to 40°C)
Temperature Setting	±0.1°C / 1.0°C to 99°C	±0.1°C / 1.0°C to 99°C
Electrical Approval	Power Pack UL, CSA, CE	Power Pack UL, CSA, CE
Shipping Weight	25 lbs./ 11.34 kg	25 lbs./ 9.98 kg

6. Warranty and Service

6.1 Warranty

When used in laboratory conditions and according to these operating instructions Boekel warrants this product to be free of defective parts, materials and workmanship for a period of two years from the date of shipment. The liability of Boekel Scientific for any defective equipment during the warranty period shall be limited to the repair of defective equipment or replacement thereof without charge for parts or labor.

6.2 Service

A Boekel Scientific Returned Material Authorization (RMA) number provided by Boekel Scientific is required before any Boekel products are returned for any reason. Contact Boekel Customer Service at 1-800-336-6929 Extension 5. A Decontamination Certificate must be completed, signed by the user, and returned to Boekel Scientific prior to receiving the RMA number. Please be sure to mark the outside of the returned goods package with this RMA number to ensure prompt handling.

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