



MaxQ Mini 4450 Shaker

Model SHKA4450 and SHKE4450

Operating Manual and Parts List 057-810-00 (7004324) Rev. 14

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Models covered by this manual	
Model number	Voltage
SHKA4450 (4324)	120V
SHKE4450 (4333)	120V
SHKA4450-1CE (4325)	240V
SHKE4450-1CE (4334)	240V
SHKA4450CC (4340)	120V
SHKE4450CC (4345)	120V
SHKA4450CC-1CE (4341)	240V
SHKE4450CC-1CE (4367)	240V
SHKE4450GM (4335)	240V
SHKE4450CCGM (4347)	120V

MANUAL NUMBER 057-810-00 (7004324)

14	40722	7/10/17	Added gas sprigs statement to Maintenance	bpg
13	40453	9/13/16	Updated circuit breaker P/N in Replacement Parts from 330-399-000 to 330-138-00	ccs
12	40139	4/15/15	Updated warranty information	ccs
11	31361	7/18/14	Removed CE reference from pg 2-1	ccs
10	31164/OS-775	7/9/14	Added care and cleaning of the acrylic lid to Section 7	ccs
9	30954	4/10/14	Updated Setting Timer for Continuous Shaking Step 3 - pg 5-8	ccs
8	30837/OS-738	2/27/14	Removed obsolete Model 4326	ccs
7	29034	9/10/12	Updated hyper terminal info on pg 5-9	



Important Read this instruction manual. Failure to read, understand and follow the instructions in this manual may result in damage to the unit, injury to operating personnel, and poor equipment performance. ▲

Caution All internal adjustments and maintenance must be performed by qualified service personnel. ▲

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Important operating and/or maintenance instructions. Read the accompanying text carefully.



Potential electrical hazards. Only qualified persons should perform procedures associated with this symbol.



Equipment being maintained or serviced must be turned off and locked off to prevent possible injury.



Hot surface(s) present which may cause burns to unprotected skin, or to materials which may be damaged by elevated temperatures.



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- ✓ Always use the proper protective equipment (clothing, gloves, goggles, etc.)
- ✓ Always dissipate extreme cold or heat and wear protective clothing.
- ✓ Always follow good hygiene practices.
- ✓ Each individual is responsible for his or her own safety.

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When more extensive service is necessary, we will assist you with direct factory trained technicians or a qualified service organization for on-the-spot repair. If your service need is covered by the warranty, we will arrange for the unit to be repaired at our expense and to your satisfaction.

Regardless of your needs, our professional telephone technicians are available to assist you Monday through Friday from 8:00 a.m. to 6:00 p.m. Eastern Time. Please contact us by telephone or fax. If you wish to write, our mailing address is:

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International customers, please contact your local Thermo Scientific distributor.

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Section 1 Safety Information

Your Thermo Scientific MaxQ Mini 4450 Shakers have been designed with function, reliability, and safety in mind. It is your responsibility to install it in conformance with local electrical codes. For safe operation, pay attention to the cautions and warnings throughout the manual.

This manual contains important operating and safety information. The user must carefully read and understand the contents of this manual prior to the use of this equipment.

Warnings

- Do not modify construction and/or assembly of equipment.
- Do not remove tags, labels, decals or other information from the unit.
- Stand clear of equipment when it is operating.
- If shaking action will result in the evolution of gases or fumes, carry out the operation in a well-ventilated laboratory hood.
- Do not use equipment for other than its intended purpose. Use only the accessories and attachments that are shipped with the equipment or are specified for it. Substituting other attachments or accessories can produce hazards or make the unit inoperative.
- Perform regular maintenance service as specified in this manual and keep unit in good repair. Do not operate with known defects.
- Do not use the shaker to mix flammable materials or where the transfer of mechanical energy to glass could cause glass breakage.

Section 2 Product Profile

The Thermo Scientific MaxQ Mini 4450 bench top, incubated shakers are available in either analog or digital control configurations:

- Analog shakers: SHKA4450, SHKA4450CC, SHKA44500-1CE and SHKA4450CC-1CE: control temperature by a Proportional/ Integral/ Derivative microprocessor-based controller. Solid-state control maintains time and speed and is adjustable with rotary dials. Analog tachometer displays speed in RPM, verifying accuracy of speed setting.
- Digital shakers: SHKE4450, SHKE4450CC, SHKE4450-1CE and SHKE4450CC-1CE: control temperature, time and speed by a Proportional/Integral/Derivative (PID) microprocessor-based controller that is adjustable with membrane switches on a keypad in 1 RPM increments. Flashing display indicates power interruption. Pressing any key will clear display. Non-volatile memory maintains speed and time set points in the event of a power interruption. Speed and time set points are automatically reactivated after power is restored.
- Models SHKA4450CC, SHKA4450CC-1CE, SHKE4450CC and SHKE4450CC-1CE include a cooling coil to allow a below ambient temperature in the shaker's chamber.
- Temperature range 5°C above ambient to 80°C.
- Drive interrupt halts shaking action when lid is opened.
- All set points are retained by non-volatile memory that automatically reactivates after power is restored.
- Visual, user adjustable over-temperature safety signal with independent thermostat controls the heat if main controller fails.
- 3/4 inch (1.9 cm) triple eccentric orbital drive.
- 6 permanently lubricated ball bearings.
- 35 lb (15.9 kg) platform load capacity at safe speeds less than 400 rpm for analog shakers and less than 500 rpm for digital shakers.

Analog Control Panel Features

1. SPEED Control: Sets platform rotation speed.
2. HIGH-LIMIT Light: Illuminates when high limit thermostat is controlling temperature.
3. TEMPERATURE Controller: Maintains temperature.
4. TIME(R): Allows user to choose continuous timing or set timed operation.
5. Heat Switch: Activates heater, turns heat on and off.
6. Speed Tachometer: Analog display of platform rotation speed (RPM).

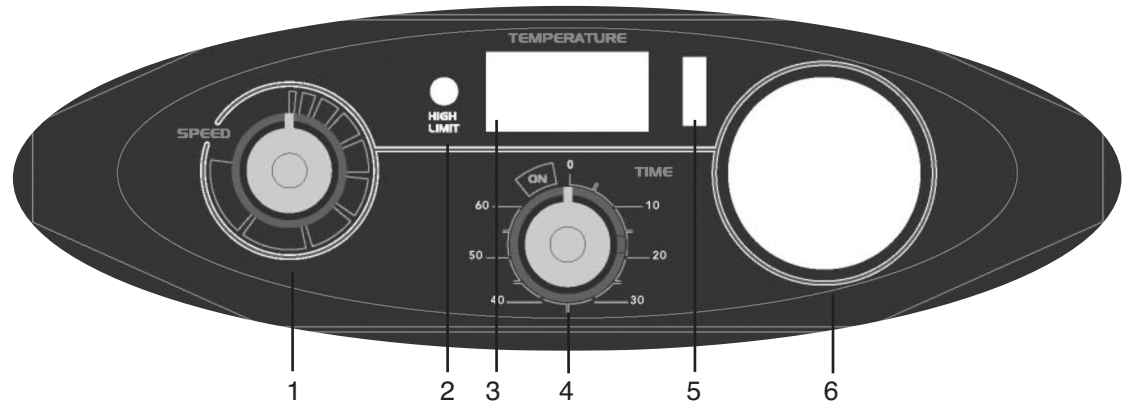


Figure 2-1. Analog Control Panel

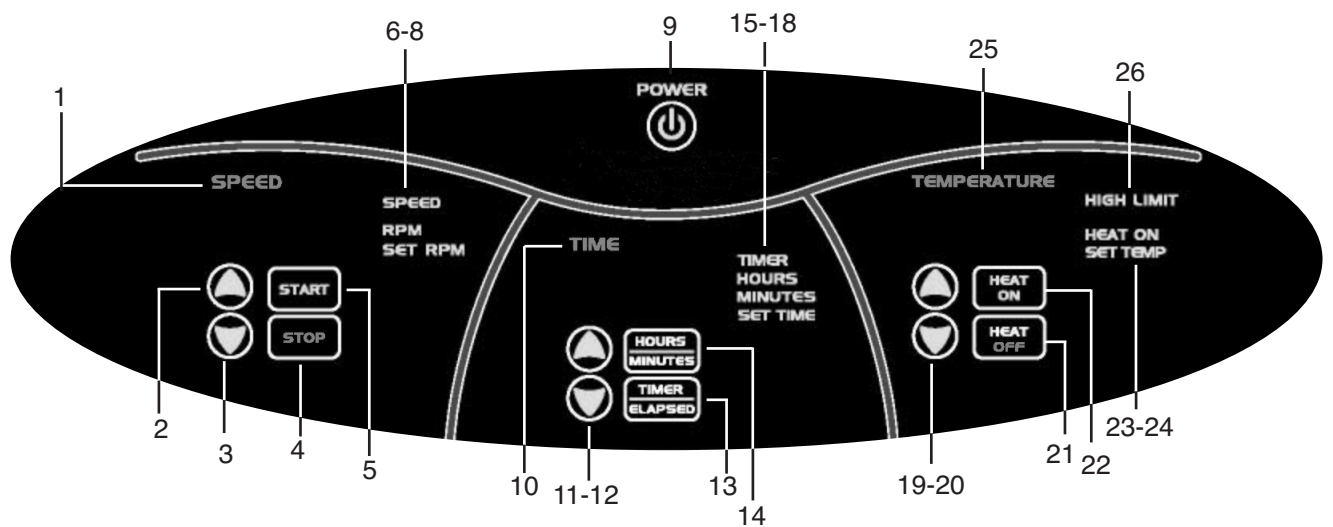


Figure 2-2. Digital Control Panel

Digital Control Panel Features

1. SPEED Display: 3-digit LED indicates actual or set point speed
2. Up Arrow Switch: Increases platform rotation speed
3. Down Arrow Switch: Decreases platform rotation speed
4. STOP Switch: Stops platform rotation
5. START Switch: Starts platform rotation
6. SPEED Light: Red light Illuminates when a locked rotor or over-speed condition exists
7. RPM Light: Illuminates to indicate actual speed
8. SET RPM Light: Illuminates when speed is being set
9. POWER Switch: Turns power on and off to shaker
10. TIME Display: 3-digit LED indicates time remaining or elapsed time
11. Up Arrow Switch: Increases shaking time
12. Down Arrow Switch: Decreases shaking time
13. TIMER/ELAPSED: Allows the user to choose elapsed time operation, ELAPSED, or timed operation, TIMER
14. HOURS/MINUTES Membrane Switch: Allows user to choose timing operation in either hours or minutes
15. TIMER: Allows the user to choose elapsed time operation, ELAPSED is the default setting. User must press TIMER switch for timing operations
16. HOURS: Timer indicates hours
17. MINUTES: Timer indicates minutes
18. SET TIME: Illuminates when time is being set
19. Up Arrow Key: Increases temperature
20. Down Arrow Key: Decreases temperature
21. HEAT ON Switch: Turns on heat
22. HEAT OFF Switch: Turns off heat
23. HEAT ON Light: Indicates heaters are energized
24. SET TEMP Light: Indicates temperature can be set
25. TEMPERATURE Display: 3-digit LED indicates chamber temperature
26. HIGH LIMIT Light: Indicates hi-limit control has been activated.

Section 3 General Specifications

Catalog Number	SHKA4450, SHKA4450CC	SHKA4450-1CE, SHKA4450CC-1CE	SHKE4450, SHKE4450CC	SHKE4450-1CE, SHKE4450CC-1CE
Electrical				
Voltage AC	120	220-240	120	220-240
Amperage	4.5	2.5	4.5	2.5
Wattage	500	500	500	500
Frequency (Hz)	50/60	50/60	50/60	50/60
Speed Accuracy	40 to 400 RPM, ± 10	40 to 400 RPM, ± 10	15 to 500 RPM, ± 1	15 to 500 RPM, ± 1
Timer	Continuous or timed operation from 1 minute to 60 minutes	Continuous or timed operation from 1 minute to 60 minutes	Continuous or timed operation from 0.1 hour up to 999 hours or 0.1 minute to 999 minutes	Continuous or timed operation from 0.1 hour up to 999 hours or 0.1 minute to 999 minutes
Display	LED display indicates temperature in 0.1°C increments. Analog tachometer displays speed in rpm	LED display indicates temperature in 0.1°C increments. Analog tachometer displays speed in rpm	3 individual LED displays indicate temperature, time and speed simultaneously. 3 characters, height 1/2 inches (1.27 cm)	3 individual LED displays indicate temperature, time and speed simultaneously. 3 characters, height 1/2 inches (1.27 cm)
Mutable Alarms	None	None	Audible portion of the alarm can be silenced for a period of 1 hour without deactivating the actual alarm condition by depressing any key.	Audible portion of the alarm can be silenced for a period of 1 hour without deactivating the actual alarm condition by depressing any key.

Section 3

General Specifications

Catalog Number	SHKA4450, SHKA4450CC	SHKA4450-1CE, SHKA4450CC-1CE	SHKE4450, SHKE4450CC	SHKE4450-1CE, SHKE4450CC-1CE
Alarm Speed	None	None	Audible with flashing led indicate when speed deviates more than 10% of set point	Audible with flashing led indicate when speed deviates more than 10% of set point
Speed Shut Off	None	None		
Timer	Continuous operation (hold) or timed operation from 1 to 60 minutes.	Continuous operation (hold) or timed operation from 1 to 60 minutes.	Beeps twice when time has expired. Shaking motion stops.	Beeps twice when time has expired. Shaking motion stops.
Unbalanced Load	None	None	If the unit is running in an unbalanced condition, an alarm will sound and the shaker will stop until the end user corrects the condition. The speed display will flash "bAL" on speed panel LED.	If the unit is running in an unbalanced condition, an alarm will sound and the shaker will stop until the end user corrects the condition. The speed display will flash "bAL" on speed panel LED.
Motor	Permanent Magnet DC	Permanent Magnet DC	Solid State Brushless DC	Solid State Brushless DC
Soft Start Feature	None	None	Software algorithms prevent sudden start/stops.	Software algorithms prevent sudden start/stops.

Intended Use

Orbital shakers are designed to provide increased aeration in a stable temperature environment.

Unintended Use

- 1) Not intended for use in Class I or II applications as defined in 21 CFR
- 2) Not intended for mixtures of flammable materials

Catalog Number	SHKA4450, SHKA4450CC	SHKA4450-1CE, SHKA4450CC-1CE	SHKE4450, SHKE4450CC	SHKE4450-1CE, SHKE4450CC-1CE
RS232 Interface*	None	None	Monitor speed, temperature and time with a computer	Monitor speed, temperature and time with a computer
Recorder Output* (Located on left side rear of shaker)	None	None	10mv/C output monitors temperature with external chart recorder	10mv/C output monitors temperature with external chart recorder
Optional Platform Dimensions L X W	13" x 11" (33.0 x 27.9 cm)	13" x 11" (33.0 x 27.9 cm)	13" x 11" (33.0 x 27.9 cm)	13" x 11" (33.0 x 27.9 cm)
Exterior Dimensions L x W x H	27.16" x 14.09" x 15.75" (69.0 x 35.8 x 40.0 cm)	27.16" x 14.09" x 15.75" (69.0 x 35.8 x 40.0 cm)	27.16" x 14.09" x 15.75" (69.0 x 35.8 x 40.0 cm)	27.16" x 14.09" x 15.75" (69.0 x 35.8 x 40.0 cm)

Environmental Operating Conditions

Pollution Degree 2**

Installation Category II**

Altitude 2000 meters MSL (Mean Sea Level)

Relative Humidity . . 20% to 80% maximum, non-condensing

Electrical Supply 120 VAC or 240 VAC

Voltage Tolerance ±10% of normal rated line

Temperature 15°C to 32°C

Product Usage Indoor use only

**Interface cables not to exceed 9.8' (3 m) in length.*

***Refer to IEC 664-1*

Caution Operation of a shaker in a CO₂ enriched atmosphere is not recommended. The formation of carbonic acid could cause electrical failures. ▲

Declaration of Conformity available on request.

Section 4 Unpacking and Installation

The shipping carton should be inspected upon delivery. When received, carefully examine for any shipping damage before unpacking. If damage is discovered, the delivering carrier should specify and sign for the damage on you copy of the delivery receipt.

Open the carton carefully making certain that all parts are accounted for before packaging materials are discarded. After unpacking, if damage is found, promptly report it to the carrier and request a damage inspection.

Important Failure to request an inspection of damage within a few days after receipt of shipment absolves the carrier from any liability for damage. Call for a damage inspection promptly.

Unpacking

Use the packing list below when unpacking to verify that the complete unit has been received. Do not discard packing materials until all is accounted for.

The following items are included in the shipment:

- Inspection tag
- Mounting plate mat
- Thumbscrew knob
- Male connector (digital only)

If any items are missing, contact Technical Services.

Location

- Put the shaker on a level table or bench capable of supporting the weight of the shaker with any accessories while in operation.
- Place shaker near an electrical outlet that matches the unit's nameplate requirements.
- Allow approximately 2" (5 cm) of clearance around the unit for free air convection, accessory attachments and user convenience.

Electrical Requirements

- SHKA4450, SHKA4450CC, SHKE4450 and SHKE4450CC shakers require a 120VAC, 60Hz power source. They are supplied with a 3-wire line cord and should be plugged into an outlet designed for 3-prong plugs. If an extension cord is used, it also should be the 3-wire grounded type. For an outlet designed to accept 2-prong plugs (ungrounded), it is required that a qualified electrician replaces the outlet with a new, grounded type.
- SHKA4450-1CE, SHKA4450CC-1CE, SHKE4450-1CE and SHKE4450CC-1CE shakers require a 240VAC, 50/60Hz power source. Power cords are supplied.
- If a plug must be installed, use only the 3-prong grounded type, rated for the unit load requirements and matching the power outlet. Make sure the green ground wire is secured to the plug ground terminal.
- To eliminate hazard of electrical shock, make sure floor around shaker is dry. In the event of accidental spilling or splashing of liquids, clean up and/or neutralize the spilled liquids before continuing.
- Leave shaker disconnected when not in use.

Warning Do not operate shaker with a damaged electrical cord. ▲

Platform Installation

1. Select the appropriate platform for the vessels to be shaken. A wide variety of platforms and accessories are available:
 - Dedicated platforms have the maximum number of flask clamps attached for safe operation.
 - Combination platforms allow the user to shake a wide variety of different sized vessels on the same platform.
2. Carefully position the platform horizontally over the shaker's mounting plate aligning the 4 mounting holes.
3. Position one of the thumbscrews provided through each of the 4-platform mounting holes and tighten securely.

Caution Do not operate shaker with an unbalanced load. Platforms should be loaded for optimum stability. Do not lift shaker by the platform. ▲

Flask Clamp Installation

- Each flask clamp contains a support spring located at the narrow top of the clamp.
 - Depending on the size of the clamp, the clamp base may contain one or several screws necessary to secure the clamp to the platform. All screws provided with the clamp must be properly attached to the platform.
1. Carefully place the desired vessel in the clamp by first pulling the clamp spring far enough apart to enable the flask base to be positioned inside the clamp. Secondly, gently slide the flask into its proper position securing it to the wider bottom of the clamp. The spring will hold the body of the flask securely in place and provide security during shaking.
 2. Make sure all vessels are securely clamped before turning on unit.

Wherever possible, vessels should contain a stopper to prevent hazardous substances being thrown out during the mixing action.

Warning Do not operate the shaker at speeds that will cause the contents of vessels to be thrown out. ▲

Test Tube Rack Installation

1. Position the test tube rack on the combination platform so that the cutouts on the rack's outside bottom are aligned with corresponding mounting holes on the platform. There are two cutouts on each side of the rack.
2. Secure the rack to the platform with mounting screws provided with the rack.

Section 5 Operation

Warning It is recommended that shaking action be started at a low speed in order to check that all vessels are secure and that no spilling of contents will occur. ▲

Note The shaker will not operate if the timer is in the Off position.

Analog

Refer to Section 2 for control panel references.

Power Switch

1. Depress top portion of power switch to turn on shaker.
2. Depress bottom portion of power switch to turn off shaker.

Speed Control and Display

1. Slowly rotate the knob on the solid-state speed control clockwise to increase speed and counterclockwise to decrease speed. The markings on the outside of the dial are for reference purposes only.
2. The speed control tachometer provides an analog readout of the actual platform rotation speed up to a maximum of 400 rpm.

Timer

1. From the 12 o'clock off position, rotate timer knob counterclockwise to the ON position to initiate continuous operation.
2. For timed operation, rotate timer knob clockwise from 1 minute to 60 minutes. The markings on the side of the dial are in 5-minute increments.

Temperature Controller/ Setting Temperature

Refer to Figure 5-1 for control panel references.

1. **CONTROLLER SELF-TEST:** When the shaker is powered up, the controller will display 8888 along with the three decimal points and the HEAT ON indicator lamp. The display will then blank out for 2 seconds before showing the chamber temperature.
2. **HEAT ON INDICATOR:** The HEAT ON indicator lamp is lit when the chamber heaters are receiving power. The lamp will normally flash when the chamber temperature is at set point.
3. **SET POINT ADJUSTMENTS:** The temperature controller normally displays the chamber temperature. To view or change the temperature set point proceed as follows:
 - a. Press and hold the “star” (*) key, and use either the up or down arrow key to adjust the set point to the desired temperature. Release the “star” (*) key.
 - b. Allow at least 30 minutes for the temperature to stabilize.

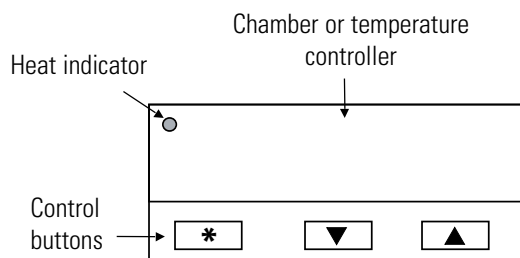


Figure 5-1. Temperature Controller

Temperature Calibration

1. Fill a 250ml Erlenmeyer flask with approximately 100ml of water and position it at the approximate geometric center of the shaking platform.
2. Install a thermocouple inside the flask with the thermocouple junction in direct contact with the water.
3. Adjust the safety thermostat to its maximum clockwise position.
4. Press and hold the “star” (*) key and using the up or down arrow key, adjust the set point to the desired temperature.
5. Allow the unit to run for at least 30 minutes.

**Temperature Calibration
(continued)**

6. The controller display should now be indicating the set point temperature. Make note of the thermometer reading.
7. Press and hold both arrow keys until the controller display indicates “tunE”. Release the arrow keys. Press and release the down arrow key, the display should now alternate between “LEUL” and “1”. Press and hold the “star” (*) key and using the up arrow key adjust the display to read “3”. Release the “star” (*) key. The display should now alternate between “LEUL” and “3”. Press and release the up arrow key until the display indicates “Zero”. The display should now alternate between “Zero” and a numerical value.
8. Using the examples shown in Table 5-1 and the thermometer value obtained in Step 5 above, enter the correct “Zero” value into the controller by pressing the “star” (*) key and using the up or down arrow key. If there is already a “Zero” value present, then add the new value to the one already present.

Table 5-1. Determining Zero Value

Thermometer =	60°C
Controller Reading =	65°C
Subtract =	-5°C
Enter Zero value of -5 °C	
Thermometer =	70°C
Controller Reading =	65°C
Subtract =	+5°C
Enter Zero value of +5 °C	

9. When the correct “Zero” value has been entered, press and hold the two arrow keys together until the display again indicates the chamber temperature. If the procedure was done correctly, the controller display should now agree with the thermometer reading to within $\pm 0.5^{\circ}\text{C}$.
10. Allow the unit to run for at least an additional 60 minutes.
11. Re-check the thermometer reading. The controller display and the thermometer should agree to within $\pm 0.5^{\circ}\text{C}$. If not, repeat Steps 7, 8 and 9.

Setting High-Limit Control

Refer to Section 2 for control panel references. The high-limit control is located on the right front side of cabinet.

1. Make appropriate power connection.
2. Turn power switch ON.
3. Using a small screwdriver, rotate high-limit control fully clockwise.
4. Set chamber temperature.
5. Allow sufficient time for temperature to stabilize before setting the high-limit control.
6. Rotate high-limit control slowly counterclockwise until set point is reached. High-limit light will illuminate when set point is reached. Rotate high-limit control clockwise until status lamp goes out. Make an additional 1/8 of a turn clockwise beyond this point.
7. When desired temperature is achieved, load the shaker.

Warning Do not operate the shaker if any of the temperature controls become inoperative. A hazardous condition will develop which can result in injury or death, and property damage. ▲

Digital

Refer to Section 2 for control panel references.

Turning Shaker On

Begin with the shaker power being turned OFF.

1. Press POWER switch once (I) to turn ON shaker
2. POWER switch a second time (0) to turn OFF shaker.

Note There will be a 3 second delay from the time power is turned on to the time the shaker is activated - control panel will illuminate when shaker power is activated.

Setting Shaking Speed

1. Hold down appropriate arrow membrane switch in the speed module of the control panel, up or down, until desired speed is set up to 500 rpm. SET RPM light will illuminate.
2. Press START membrane switch to begin shaking. RPM light will illuminate.
3. Press STOP membrane switch to end shaking. SET RPM light will illuminate.

Note Speed can be changed without pressing the START or STOP switches. Simply press the appropriate UP or DOWN switch until desired RPM is reached. ▲

Calibrating Shaking Speed

1. Choose a speed for which calibration is desired by using the shaker's up or down arrow keys.
2. Measure current shaker speed by using a digital hand-held tachometer.
3. If the tachometer reading matches the shaker display, no calibration is necessary. If the tachometer reading is different from the shaker's display, then calibration is required.
4. To access Calibration mode, press and hold the START key. Press and release the STOP key, then release the START key.
5. The decimal point on the SPEED display will flash indicating you are in Calibration mode.
6. Use the up or down arrow keys to set the shaker speed to match the tachometer's readout.
7. Press STOP key to enter the new speed value.
8. Press START key to exit the calibration mode.

Setting Operating Temperature

1. Press and hold up arrow key to increase temperature, release key when desired set point is obtained.
2. Press and hold down arrow key to decrease temperature, release key when desired set point is obtained.
3. Once set, temperature control is initiated by pressing the heat on button; the heater will react and start increasing the temperature to reach the set point.
4. During operation, both the up and down arrow keys can be used to adjust the temperature to a new set point.

Setting High-Limit Control

Note The hi-limit control is located on lower front side of the cabinet.

1. Make appropriate power connection.
2. Turn power switch ON.
3. Using a small screwdriver, rotate high-limit control fully clockwise.
4. Set chamber temperature.
5. Allow sufficient time for chamber temperature to stabilize before setting the high-limit control.
6. Turn the high-limit control slowly counterclockwise and wait several seconds between adjustments since there may be a 5 to 10 second delay before the high-limit alarm sounds. Rotate the high-limit control slowly clockwise approximately 1/8 of a turn beyond this point.
7. When desired temperature is achieved, load the shaker.

Warning Do not operate the unit if any of the temperature controls become inoperative. A hazardous condition will develop which can result in injury or death and property damage. ▲

AC Power Loss

The operating microprocessor possesses a non-volatile memory. Upon resumption or recovery from an AC power loss, the following will be noted:

- All readouts will flash until any key is pressed.
- If unit was shaking at the time of power failure, it will resume operation at the speed and timer settings that were entered at the time that AC power failed.

Temperature Calibration

1. Fill a 250-ml Erlenmeyer flask with approximately 100ml of water and position it at the approximate geometric center of the shaking platform.
2. Install a thermocouple inside the flask with the thermocouple junction in direct contact with the water.
3. Adjust the safety thermostat to its maximum clockwise position.
4. Using the up and down arrow keys, adjust the set point temperature to read 37°C or any other desired set point.
5. Allow sufficient time for chamber temperature to stabilize.
6. Press HEAT ON button and, while continuing to hold, press and release the HEAT OFF button. Now, release the HEAT ON button.
7. The decimal point should now be flashing indicating that the unit is in the temperature calibration mode.
8. Use the up and down arrow keys to adjust the temperature on LED readout to match the temperature reading on the thermocouple meter.
9. Press the HEAT OFF button. The beeper will sound indicating that the new calibration value you have entered is now stored in the nonvolatile memory of the temperature controller.
10. Press HEAT ON button twice to complete the return to normal operating mode.

Note It is important to press the Heat Off button to exit the calibration mode.

Setting Timer for Timed Shaking

1. Press TIMER/ELAPSED button until TIMER and SET TIME lights are illuminated. The HOURS or MINUTES light will also light up at this point, depending on which option was previously chosen.
2. Press HOURS/MINUTES button for desired timing mode.
3. Hold down appropriate arrow button in the TIME module of the control panel, up or down, until desired timing cycle is set from 0.1 hour up to 999 hours, or from 0.1 minute to 999 minutes depending on which timing mode is chosen. SET TIME light will illuminate.
4. Press START to begin timed shaking; countdown will begin from time set. TIMER and MINUTES or HOURS lights will illuminate and timer will count down from time selected. An audible alarm will sound at the end of the timing cycle and platform rotation will cease.

Setting Timer for Continuous Shaking

1. Press TIMER/ELAPSED button until ELAPSED light is illuminated. The HOURS or MINUTES light will also light up at this point depending on which option was previously chosen.
2. Press HOURS/MINUTES membrane switch for desired timing mode.
3. TIME display should show 000. Press START to begin timed shaking. Timer will begin to count up and will display accumulated time in display window. Platform rotation will continue until the operator presses the Stop button. The TIME display will flash when ELAPSED time reaches 999 minutes or 999 hours.

Setting Timer for Continuous Timing

1. Press TIMER/ELAPSED button until TIMER light is off. The HOURS or MINUTES light will also light up at this point, depending on which option was previously chosen.
2. Press HOURS/MINUTES button for desired timing mode.
3. Press START to begin timed shaking. TIME display should show 000. Timer will begin to count up and will display accumulated time in display window. Display will flash when 999 minutes or 999 hours is achieved.

RS232 Interface Port

The RS232 interface port is located on the left side rear of the shaker cabinet and requires the use of a laptop or desk top computer running Microsoft Windows 98 or newer operating system.

Note RS232 interface port is for output only. Interface cables must not exceed 9.8' (3m) in length.



RS232 Interface Port

RS232 Communication Configuration

Note The following paragraphs detail the step-by-step procedures for configuring Microsoft® Hyperterminal running on a host computer using Windows® XP. These instructions may need to be modified to be used with a different terminal emulator program and/or operating system. Contact Technical Services if further assistance is required.

1. Power up the host computer and close any running applications.
2. Open the HyperTerminal application by clicking on "Start" \ "Programs" \ "Accessories" \ "Communications" \ "HyperTerminal."
3. In the "Connection Description" box, enter the name "Max Q Shaker" and choose an Icon and click "OK."
4. In the "Connect To" box, verify that "COM1" is selected under "Connect Using." Click "OK."
5. In the "COM1 Properties" box \ "Port Settings" folder select the following options:
 - Bits per second: 19200
 - Data bits: 8
 - Parity: None
 - Stop bits: 1
 - Flow control: None

After verifying the above settings, click "OK."

6. In the main dialog box click on "File" \ "Save."
7. Exit the program by clicking on "File" \ "Exit" \ "Yes".

RS232 Communication Configuration (cont.)

8. Verify the program was saved by going to "Start" \ "Programs" \ "Accessories" \ "Communications" \ "HyperTerminal" \ "Max Q Shaker."
9. This completes the configuration of HyperTerminal.
10. Turn shaker off and connect computer (COM 1) to shaker (COM PORT) with DB-9 serial printer cable.
11. Start HyperTerminal by clicking on "Max Q Shaker."
12. Power up shaker. Shaker will screen print speed, time and temperature at one-minute intervals.

Using the Optional Cooling Coil

Either tap water or other user-supplied media from a refrigerated circulator flows through the submerged cooling coil.

1. Adjust setpoint to the desired temperature.
2. Connect the coolant hoses to the cooling coil fittings on the back of the unit. Start the coolant flowing through the cooling coil; flow rate should be at least 6-8 liters per minute. The coolant temperature must be at least 15°C less than the desired chamber temperature. The coolant flow and temperature must be constant.
3. Allow the chamber temperature to stabilize at the setpoint.
4. Readjust the safety thermostat.
5. Lift the cover and load platform. Close lid.

Section 6 Troubleshooting

The following is intended as a reference guide to help in servicing this unit if problems should occur.

Problem	Possible Causes	Solutions
Shaker doesn't operate	Check if power cord is plugged in.	Plug in.
	Check if power supply matches requirements on data label.	Locate power supply that matches unit requirements.
	Digital: check circuit breaker.	Reset circuit breaker.
	Digital: check for flashing lights on control panel.	Press any button on control panel.
	Digital: check if elapsed timer is flashing.	Reset timer.
	Analog: check if timer is in off position.	Set timer for continuous or timed operation.
	Analog: check if power switch is functioning.	Replace if defective.
Platform doesn't rotate or has erratic speed	Check for power to motor.	Replace motor if defective.
	Check drive belt.	Replace if worn, broken or slipped off pulley.
	Analog: check for power to speed control.	Replace if defective.
Shaker won't heat	Digital: make sure "HEAT ON" lamp is lit.	Push "HEAT ON" button.

Over Temperature Protection

In the unlikely event that the programmed high-limit and the user adjustable high-limit thermostats fail, there is a third over-temperature thermostat. The thermostat is located underneath the shaker's back panel. If the shaker fails to heat with the "HEAT ON" lamp lit and the user settable high-limit thermostat set to the fully clockwise position, it will be necessary to reset the secondary over-temperature thermostat.

To do so, proceed as follows:

1. Disconnect power cord from outlet.
2. Remove rear panel.
3. Locate the thermostat on top of plenum. The thermostat has a small button that needs to be pressed in to reset the thermostat.
4. Once the thermostat is reset, reinstall the rear panel, plug the power cord back into the outlet and verify the unit is heating again.
5. If the shaker still fails to heat, contact Technical Services for further assistance.

Section 7 Maintenance

Wash the exterior of the unit with a soft cloth using a solution of mild soap and water, rinse off with clean water and dry thoroughly.

Warning To avoid risk of electric shock, disconnect equipment from power source before performing any maintenance. ▲

Gas Springs

The gas springs should be checked periodically, and ideally every six months. The opening force, as measured from the front lip from a closed position, should be below 100 N (22.5 lbf) maximum. If the force is above this value, the gas springs should be replaced. If a force measurement is not possible, the gas springs should be replaced every two years.

Replacing Platform Mounting Plate

1. Remove the platform by loosening the 4 thumbscrews, remove ribbed mat, remove the 9 smaller screws on the platform mounting plate, there are 3 Phillips screws at each of the 3 bearing mounts.
2. Position the platform mounting plate atop the shaker body and install all 9 screws by hand until they are finger-tight only. Rotate the speed control fully counterclockwise (OFF) and plug the unit into an outlet. Rotate the speed control knob slowly in the clockwise direction to allow the shaker to orbit at its slowest speed.

Note While adjusting the platform retaining screws, make certain lid switch, located at back of chamber, is activated (pressed in).

3. While it is slowly orbiting, slightly tighten each of the A screws in Figure 1. Repeat this procedure by slightly tightening all the B screws, then complete procedure by tightening the C screws.

Caution All screws must first be slightly tightened to seat the plate properly. ▲

4. Repeat the screw-tightening procedure at 50-100 RPM until all 9 screws are securely tightened.

Replacing Platform Mntg Plate (cont.)

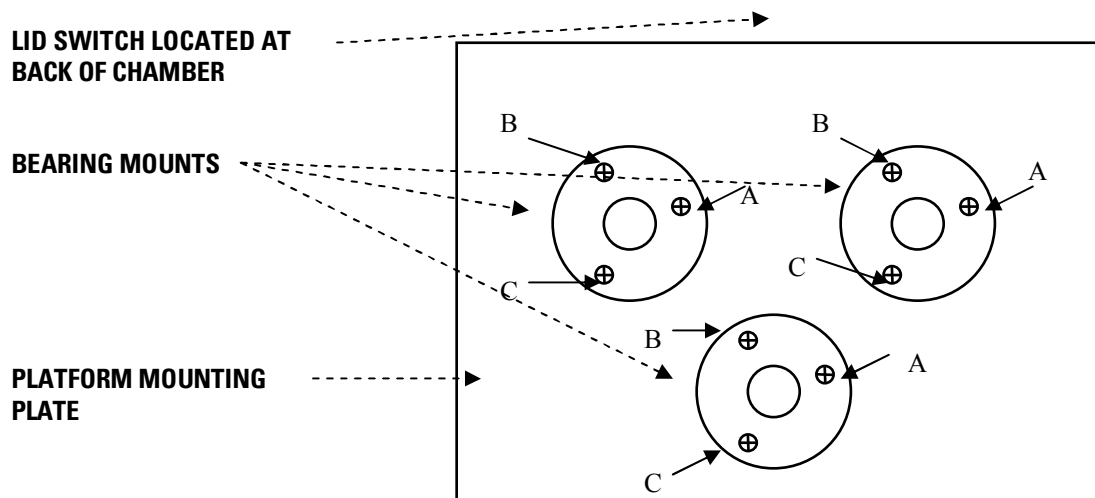


Figure 7-1. Platform Mounting Plate

Platform Maintenance

Suggested with Every 3 Months of Constant Use

Remove the platform by loosening 4 thumbscrews on the corners of the platform. Remove the platform holder pan by removing 9 screws around the spindles to expose the belt and interior parts. Inspect the drive belt for wear. Order a replacement if necessary.

Caution Make no attempt to service or repair a Thermo Scientific product under warranty before consulting your Thermo Scientific dealer. After the warranty period, such consultation is still advised, especially when repair may be technically sophisticated or difficult. If assistance is needed beyond what the distributor can provide, call Technical Services. No merchandise should be returned directly to the factory without obtaining a Return Materials Authorization (RMA) number from Technical Services. ▲

Note The shaking mechanism is equipped with sealed ball bearings which do not require further lubrication or adjustment.

Care and Cleaning of the Acrylic Lid

Washing: Clean with a solution of mild soap or detergent and lukewarm water. Use a clean soft cloth, applying only light pressure. Rinse with clean water and blot dry with a damp cloth or chamois.

Grease, oil, or tar may be removed with a good grade of hexane, aliphatic naphtha, or kerosene. These solvents may be obtained at a paint or hardware store and should be used in accordance with manufacturer's recommendations.

Acrylic Lid (continued)

Caution Do not use window cleaning sprays, kitchen scouring compounds or solvents such as acetone, gasoline, benzene, alcohol, carbon tetrachloride, or lacquer thinner. These can scratch the sheet's surface and/or weaken the sheet causing small surface cracks called "crazing." ▲

Dusting: Remove dust with a soft, damp cloth or chamois. Avoid dry or gritty cloths as they may cause surface scratches and create a static electric charge on the surface causing dust to cling to the lid.

Polishing: Protect the lid and maintain its surface gloss by occasional polishing with a good plastic cleaner and polish. Apply a thin, even coat with a soft clean cloth and polish slightly with cotton flannel. Then wipe with a damp cloth to help eliminate electrostatic charges that can attract dust particles.

Use of proper cleaning agents: When selecting a cleaning or decontamination agent, use the following table as a guideline.

Acrylic Lid (continued)

Chemical	Code	Chemical	Code
Acetic Acid (5%)	LR	Hydrogen Peroxide (3%)	R
Acetic Acid (Glacial)	N	Hydrogen Peroxide (28%)	LR
Acetone	N	Isopropyl Alcohol (30%)	LR
Ammonium Chloride	R	Kerosene	R
Ammonium Hydroxide (10%)	R	Lacquer Thinner	N
Ammonium Hydroxide (Conc.)	R	Methyl Alcohol (30%)	LR
Aniline	N	Methyl Alcohol (100%)	N
Battery Acid	R	Methyl Ethyl Ketone (MEK)	N
Benzene	N	Methylene Chloride	N
Butyl Acetate	N	Mineral Oil	R
Calcium Chloride (Sat.)	R	Nitric Acid (10%)	R
Calcium Hypochlorite	R	Nitric Acid (40%)	LR
Carbon Tetrachloride	LR	Nitric Acid (Conc.)	N
Chloroform	N	Oleic Acid	R
Chromic Acid	LR	Olive Oil	R
Citric Acid (10%)	R	Phenol Solution (5%)	N
Cottonseed Oil (Edible)	R	Soap Solution (Mild dish soap)	R
Detergent Solution (Heavy Duty)	R	Sodium Carbonate (2%)	R
Diesel Oil	R	Sodium Carbonate (20%)	R
Diethyl Ether	N	Sodium Chloride (10%)	R
Dimethyl Formamide	N	Sodium Hydroxide (1%)	R
Dioctyl Phthalate	N	Sodium Hydroxide (10%)	R
Ethyl Acetate	N	Sodium Hydroxide (60%)	R
Ethyl Alcohol (30%)	LR	Sodium Hypochlorite (5%)	R
Ethyl Alcohol (95%)	N	Sulfuric Acid (3%)	R
Ethylene Dichloride	N	Sulfuric Acid (30%)	R
Ethylene Glycol	R	Sulfuric Acid (Conc.)	N
Gasoline	LR	Toluene	N
Glycerine	R	Transformer Oil	R
Heptane	R	Trichloroethylene	N
Hexane	R	Turpentine	R
Hydrochloric Acid	R	Water	R
Hydrofluoric Acid (25%)	N	Xylene	N

R = Resistant LR = Limited Resistance N = Not Resistant

Section 8 Replacement Parts

PART NO.	DESCRIPTION	SHKA4450 , SHKA4450CC	SHKE4450, SHKE4450CC	SHKA4450-1CE, SHKA4450CC-1CE	SHKE4450-1CE, SHKE4450CC-1CE
150-318-00	Belt, Drive	xx		xx	
150-288-00	Belt, Drive 3/16 X 22-3/8		xx		xx
160-208-00	Chamber Blower-120V	xx	xx		
330-138-00	Circuit Breaker, 0.5-Amp	xx		xx	
330-119-00	Circuit Breaker, 10-Amp	xx	xx		
485-360-17	Controller, Programmed	xx			
CV1413X2	Cover Assembly	xx	xx	xx	xx
420-265-01	Dust Cover, D-Sub		xx		xx
790-078-00	Mounting Feet	xx	xx	xx	xx
560-281-00	Handle	xx	xx	xx	xx
340-364-00	Heater, 500W-120V	xx	xx		
570-380-00	Hinge, Cover	xx	xx	xx	xx
682-720-00	Keyboard With Graphics		xx		xx
560-281-00	Knob	xx		xx	
600-125-00	Knob, Locking Tab	xx		xx	
470-364-00	Linecord	xx	xx		
790-316-11	Mat, Platform	xx	xx	xx	xx
370-390-00	Motor		xx		xx
MT1410X1	Motor Assembly	xx			
MT1410X2	Motor Assembly			xx	
805-931-00	Pan, Holder-Platform	xx	xx	xx	xx
019-671-08	PCB, Display-Time, Speed		x		x
019-533-09	PCB, Micro-Programmed		xx		xx
019-534-00	PCB, Power/Motor Drive		xx		xx
228-612-00	PCB, Tach	xx		xx	
460-315-00	Power Supply		xx		xx
150-287-00	Pulley, Drive	xx		xx	
150-297-00	Pulley, Driver		xx		xx
470-357-00	Ribbon Cable		xx		xx
019-445-00	Shaker Mechanism Assy	xx	xx	xx	xx
400-233-00	Solid State Relay	xx		xx	

Section 8
Replacement Parts

PART NO.	DESCRIPTION	SHKA4450, SHKA4450CC	SHKE4450, SHKE4450CC	SHKA4450-1CE, SHKA4450CC-1CE	SHKE4450-1CE, SHKE4450CC-1CE
227-598-00	Speed Control-120V	xx			
830-476-00	Spring, Gas	xx	xx	xx	xx
440-080-00	Switch, Push Button-Cover	xx	xx	xx	xx
440-397-00	Switch, Mini Rocker-Heat	xx		xx	
660-111-00	Tachometer	xx		xx	
410-632-00	Temp Sensor, RTD	xx	xx	xx	xx
920-301-00	Thermostat	xx	xx	xx	xx
330-400-00	Thermostat, OTP	xx	xx	xx	xx
270-135-00	Timer	xx		xx	
FA1413X2	Cooling Fan-240V			xx	xx
FA1413X1	Cooling Fan-120V	xx	xx		
160-208-01	Chamber Blower-240V			xx	xx
CRX125	Linecord-240V			xx	xx
CN71X124	Controller, Programmed			xx	
370-272-01	Motor Brushes	xx		xx	
330-138-00	Circuit Breaker-5.0 Amps			xx	xx
CRX108	Line Cord UK			xx	xx
CRX115	Line Cord China			xx	xx

Ordering Procedures

Refer to the Specification Plate for the complete model number, serial number, and series number when requesting service, replacement parts or in any correspondence concerning this unit.

All parts listed herein may be ordered from the Thermo Scientific dealer from whom you purchased this unit or can be obtained promptly from the factory. When service or replacement parts are needed, check first with your dealer. If the dealer cannot process your request, then contact our Technical Services Department.

Prior to returning any materials, contact our Technical Services Department for a "Return Materials Authorization" number (RMA). Material returned without an RMA number will be refused.

THERMO FISHER SCIENTIFIC ANALOG SHAKER WARRANTY USA

The Warranty Period starts two weeks from the date your equipment is shipped from our facility. This allows shipping time so the warranty will go into effect at approximately the same time your equipment is delivered. The warranty protection extends to any subsequent owner during the warranty period.

During the first year, component parts proven to be non-conforming in materials or workmanship will be repaired or replaced at Thermo's expense, labor included. For an additional 4 years, component parts proven to be non-conforming in materials or workmanship will be repaired or replaced at Thermo's expense, labor excluded. In addition, the Orbital Shaker mechanism is warranted for 10 years, parts only, F.O.B. factory. The mechanism is defined as the bearing assemblies. The warranty will be void if the equipment is altered without written authorization from Thermo. Installation and calibration is not covered by this warranty agreement. The Technical Services Department must be contacted for warranty determination and direction prior to performance of any repairs. Expendable items, i.e., glass, filters, light bulbs and lid gaskets are excluded from this warranty. Extended warranties are dependent on the units being maintained regularly as stated in the operation and service manuals.

Replacement or repair of components parts or equipment under this warranty shall not exceed the warranty to either the equipment or to the component part beyond the original warranty period. The Technical Services Department must give prior approval for return of any components or equipment.

THIS WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES, WHETHER WRITTEN, ORAL, OR IMPLIED. NO WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE SHALL APPLY. Thermo shall not be liable for any indirect or consequential damages including, without limitation, damages relating to lost profits or loss of products.

Your local Thermo Sales Office is ready to help with comprehensive site preparation information before your equipment arrives. Printed instruction manuals carefully detail equipment installation, operation, and preventive maintenance.

If equipment service is required, please call your Technical Services Department at 1-800-438-4851 (USA and Canada) or 1-740-373-4763. We're ready to answer any questions on equipment warranty, operation, maintenance, service and special applications. Outside the USA, contact your local distributor for warranty information.



Rev. 2 6/2015

THERMO FISHER SCIENTIFIC DIGITAL SHAKER WARRANTY USA

The Warranty Period starts two weeks from the date your equipment is shipped from our facility. This allows shipping time so the warranty will go into effect at approximately the same time your equipment is delivered. The warranty protection extends to any subsequent owner during the warranty period.

During the first 24 months, component parts proven to be non-conforming in materials or workmanship will be repaired or replaced at Thermo's expense, labor included. For an additional 3 years, component parts proven to be non-conforming in materials or workmanship will be repaired or replaced at Thermo's expense, labor excluded. In addition, the Orbital Shaker mechanism is warranted for 10 years, parts only, F.O.B. factory. The mechanism is defined as the bearing assemblies. The warranty will be void if the equipment is altered without written authorization from Thermo. Installation and calibration is not covered by this warranty agreement. The Technical Services Department must be contacted for warranty determination and direction prior to performance of any repairs. Expendable items, i.e., glass, filters, light bulbs and lid gaskets are excluded from this warranty. Extended warranties are dependent on the units being maintained regularly as stated in the operation and service manuals.

Replacement or repair of components parts or equipment under this warranty shall not exceed the warranty to either the equipment or to the component part beyond the original warranty period. The Technical Services Department must give prior approval for return of any components or equipment.

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The Warranty Period starts two months from the date your equipment is shipped from our facility. This allows shipping time so the warranty will go into effect at approximately the same time your equipment is delivered. The warranty protection extends to any subsequent owner during the warranty period.

During the first year, component parts proven to be non-conforming in materials or workmanship will be repaired or replaced at Thermo's expense, including labor. For an additional 4 years, component parts proven to be non-conforming in materials or workmanship will be repaired or replaced at Thermo's expense, excluding labor. In addition, the Orbital Shaker drive mechanism is warranted for 10 years, parts only, F.O.B. factory. The mechanism is defined as the bearing assemblies. The warranty will be void if the equipment is altered without the written authorization from Thermo. Installation and calibration is not covered by this warranty agreement. The local Thermo Fisher Scientific office must be contacted for warranty determination and direction prior to performance of any repairs. Expendable items, i.e., glass, filters, light bulbs and lid gaskets are excluded from this warranty. Extended warranties are dependent on the units being maintained regularly as stated in the operation and service manuals.

Replacement or repair of component parts or equipment under this warranty shall not exceed the warranty to either the equipment or to the component part beyond the original warranty period. The local Thermo Fisher Scientific office must give prior approval for return of any components or equipment.

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