



MaxQ 4000 Incubated and Refrigerated Shakers

Models SHKE4000 and SHKA4000

Operating Manual and Parts List 057-287-00 (7004342) Rev. 16

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Models covered in this manual	
Model number	Voltage
SHKA4000 (4320)	120V
SHKA4000-1CE (4321)	220-240V
SHKA4000-5 (4322)	120V
SHKA4000-6CE (4323)	220-240V
SHKA4000-7 (4338)	120V
SHKA4000-8CE (4339)	220-240V
SHKE4000 (4328)	120V
SHKE4000-1CE (4329)	220-240V
SHKE4000-5 (4330)	120V
SHKE4000-6CE (4331)	220-240V
SHKE4000-7 (4342)	120V
SHKE4000-7JPN (4343)	100V
SHKE4000-8CE (4344)	220-240V

MANUAL NUMBER 057-287-00 (7004342)

16	40722	7/10/17	Added gas springs section to Maintenance	bpg
15	41343	5/02/17	Added F-Gas statement, removed declaration of certification	bpg
14	40673	4/20/17	Updated voltage information	bpg
13	40453	9/13/16	Circuit breaker P/N in Replacement Parts from 330-250 & 330-399 to 330-138-00	ccs
12	40139	4/15/15	Updated warranty information	ccs
11	31361	7/18/14	Removed CE reference from pg 2-5	ccs
10	31164/OS-775	7/9/14	Added care and cleaning of acrylic lid to Section 3	ccs
9	30954	4/10/14	Updated Setting Timer for Continuous Shaking Step 3 - pg 5-6	ccs



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.



WEEE Compliance: Thermo Fisher Scientific has contracted with companies for recycling/disposal in each EU Member State. For further information, send an email to weee.recycle@thermofisher.com.



- ✓ 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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Whatever Thermo Scientific products you need or use, we will be happy to discuss your applications. If you are experiencing technical problems, working together, we will help you locate the problem and, chances are, correct it yourself...over the telephone without a service call.

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

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.

Your Thermo Scientific MaxQ 4000 Shaker has 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 Notes, Cautions, Warnings throughout the manual.

Warnings

To avoid electrical shock, always:

1. Use a properly grounded electrical outlet of correct voltage and current handling capacity.
2. Disconnect from the power supply prior to maintenance and servicing.

To avoid personal injury:

1. Do not use in the presence of flammable or combustible materials; fire or explosion may result. This device contains components which may ignite such materials. Not rated for use in hazardous atmospheres.
2. Wear appropriate eye and hand protection when handling hazardous chemicals.
3. Refer servicing to qualified personnel.
4. Do not modify construction and/or assembly of equipment.
5. Do not remove tags, labels, decals, or other information from the unit.
6. Stand clear of equipment when it is operating.
7. If shaking action will result in the evolution of gases or fumes, carry out the operation in a well-ventilated laboratory hood.

To avoid personal injury (continued):

8. Use equipment only for 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.
9. Perform regular maintenance service as specified in this manual and keep unit in good repair. Do not operate with known defects.
10. Do not use the shaker to mix flammable materials or where the transfer of mechanical energy to glass could cause glass breakage.

Section 2 General Specifications

Model number	All Analog "A" Series units	All Analog "A" Series units	All Digital "E" Series units	All Digital "E" Series units
Exterior Unit Dimensions				
Length	32" (81.3 cm)	32" (81.3 cm)	32" (81.3 cm)	32" (81.3 cm)
Width	22.5" (57.2 cm)	22.5" (57.2 cm)	22.5" (57.2 cm)	22.5" (57.2 cm)
Height	22" (55.9 cm)	22" (55.9 cm)	22" (55.9 cm)	22" (55.9 cm)
Electrical - Standard Temperature				
Voltage AC	120	220-240	120	220-240
Amperage	5.0	3.0	5.0	2.5
Wattage	625	725	625	625
Frequency	60	50/60	60	50/60
High Temperature				
Voltage AC	120	220-240	120	220-240
Amperage	9.0	5.0	9.0	4.5
Wattage	1100	1200	1100	1100
Frequency	50/60	50/60	50/60	50/60
Refrigerated				
Voltage AC	120	220-240	120	220-240
Amperage	14.0	7.0	14.0	7.0
Wattage	1500	1500	1500	1500
Frequency	60	50	60	50

Section 2
General Specifications

Model number	All Analog "A" Series units	All Analog "A" Series units	All Digital "E" Series units	All Digital "E" Series units
Speed Accuracy	40 to 400 rpm, ±10 rpm	40 to 400 rpm, ±10 rpm	15 to 500 rpm, ±1 rpm	15 to 500 rpm, ±1 rpm
Timer	Continuous or timed operation from 1-60 min.	Continuous or timed operation from 1-60 min.	Continuous or timed operation 0.1-999 hours or 0.1-999 mins.	Continuous or timed operation 0.1-999 hours or 0.1-999 mins.
Display	3 individual LED displays indicate temperature in 1°C increments. Analog tachometer displays speed in rpm.	3 individual LED displays indicate temperature in 1°C increments. Analog tachometer displays speed in rpm.	3 individual LED displays indicate temperature, time and speed simultaneously. 3 characters height 1/2 inch (1.27 cm)	3 individual LED displays indicate temperature, time and speed simultaneously. 3 characters height 1/2 inch (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.
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.
RS232 Interface *	None	None	Monitor speed, temperature in °C and time with a computer.	Monitor speed, temperature in °C and time with a computer.
Recorder Output *	None	None	10 mv/°C output monitors temperature with external chart recorder.	10 mv/°C output monitors temperature with external chart recorder

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

Model number	All Analog "A" Series units	All Analog "A" Series units	All Digital "E" Series units	All Digital "E" Series units
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	When speed deviates 10% of set point, unit will shut down immediately.	When speed deviates 10% of set point, unit will shut down immediately.
Timer	None	None	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.

Optional Platform Dimensions - in. (cm)	
Catalog Number	L xW
30110	Universal 18" x 18" (45.7 x 45.7 cm)

The MaxQ 4000 series of bench top, incubated and refrigerated shakers are available in either analog or digital control configurations:

- A-Class shakers: SHKA4000, SHKA4000-1CE, SHKA4000-5, SHKA4000-6CE, SHKA4000-7, SHKA4000-8CE: control temperature by a Proportional/Integral/Derivative (PID) 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. Refrigerated units feature environmentally safe CFC free insulation and coolant.
- E-Class shakers: SHKE4000, SHKE4000-1CE, SHKE4000-5, SHKE4000-6CE, SHKE4000-7, SHKE4000-8CE: control temperature, time and speed by a Proportional/Integral/Derivative (PID) microprocessor-based controller that is adjustable with switches on a keypad in 1 rpm increments. Refrigerated units feature environmentally safe CFC free insulation and coolant. 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.
- Temperature range and accuracy follow. All units have a uniformity of $\pm 0.5^{\circ}\text{C}$ at 37°C in flask:

Standard Temperature: SHKA4000, SHKA4000-1CE, SHKE4000, SHKE4000-1CE,
 10°C above ambient to 60°C , $\pm 0.1^{\circ}\text{C}$ at 37°C in flask.

High Temperature: SHKA4000-5, SHKA4000-6CE, SHKE4000-5, SHKE4000-6CE,
 10°C above ambient to 80°C , $\pm 0.1^{\circ}\text{C}$ at 37°C in flask.

Refrigerated: SHKA4000-7, SHKA4000-8CE, SHKE4000-7, SHKE4000-8CE,
 15°C below ambient to 60°C , $\pm 0.1^{\circ}\text{C}$ at 37°C in flask. Refrigeration system needs to be turned off whenever the set point is at or above 32°C .

In addition, all versions offer:

- Space efficient tubular heaters.
- 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.
- 50 lb (22.7 kg) platform load capacity at safe speeds less than 400 rpm for A-Class shakers and less than 500 rpm for E-Class shakers.

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

***Refer to IEC 664-1*

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

Fluorinated Greenhouse Gases

Compliant with REGULATION (EU) No 517/2014 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on fluorinated greenhouse gases.

This product contains fluorinated greenhouse gases in a hermetically sealed system. If a leak in the sealed system is detected, the operator shall repair without undue delay.

The following model is designed for use with the following amounts of fluorinated greenhouse gases:

Model	Refrigerant	Amount (kg)	GWP
SHKE4000-8CE	R-134a	0.227	1430

Declaration of Conformity

Copies of the Declaration of Conformity are available upon request.

Section 3 Control Panels

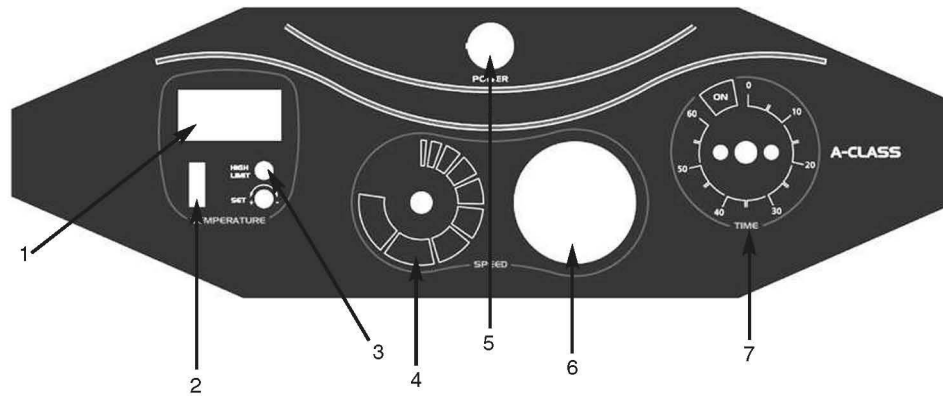


Figure 3-1. A-Class Control Panel

A-Class Control Panel Features

1. Temperature Controller: Maintains chamber temperature.
2. Temperature Switch: Activates heater-allowing controller to maintain temperature.
3. Temperature High-Limit Light: Illuminates when high limit thermostat is controlling chamber temperature.
4. Speed Control: Sets platform rotation speed.
5. Power Switch: Turns power on and off to shaker.
6. Speed Tachometer: Analog display of platform rotation speed.
7. Time(r): Allows user to choose either continuous or timed operation.

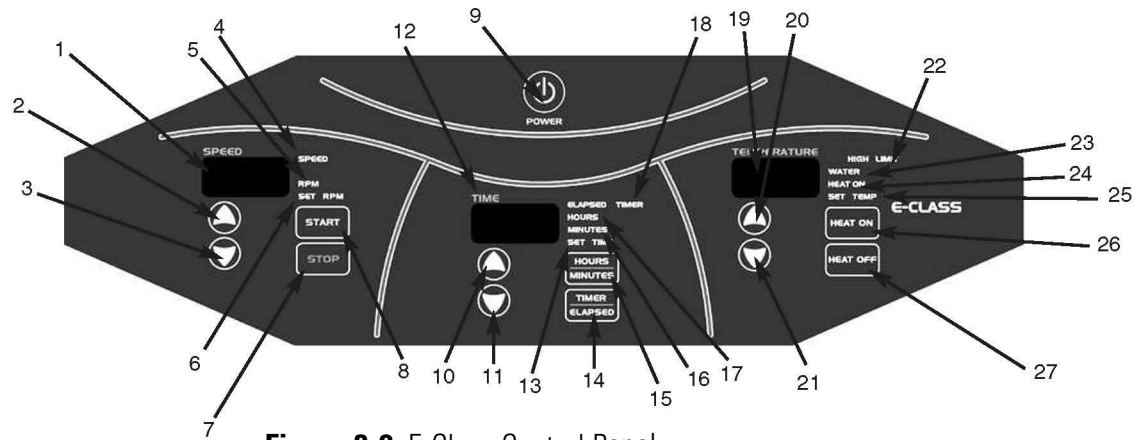


Figure 3-2. E-Class Control Panel

E-Class Control Panel Features

1. Speed Display: 3 digit LED indicates actual or set point speed
2. Up Arrow Key: Increases platform rotation speed
3. Down Arrow Key: Decreases platform rotation speed
4. Speed Light: Red light Illuminates when a locked rotor or over-speed condition exists
5. RPM Light: Illuminates to indicate actual speed
6. Set RPM Light: Illuminates when speed is being set
7. Stop Switch: Stops platform rotation
8. Start Switch: Starts platform rotation
9. Power Switch: Turns power on and off to shaker
10. Up Arrow key: Increases shaking time
11. Down Arrow key: Decreases shaking time
12. Time(r) Display: 3 digit LED indicates time remaining or elapsed time
13. Set Time: Illuminates when time is being set
14. Timer/Elapsed: Allows the user to choose elapsed time operation, elapsed, or timed operation, timer.
15. Hours/Minutes Switch: Allows user to choose timing operation in either hours or minutes

E-Class Control Panel Features (continued)

16. Minutes: Timer indicates minutes
17. Hours: Timer indicates hours
18. Elapsed Timer Light: Indicates accumulated time
19. Temperature Display: 3 digit LED indicates chamber temperature
20. Up Arrow Key: Increases temperature
21. Down Arrow Key: Decreases temperature
22. High-Limit Light: Indicates high-limit control has been activated
23. Water Light: This display has no function on this unit
24. Heat On Light: Indicates heaters are energized
25. Set Temp Light: Indicates temperature can be set
26. Heat On Switch: Turns on heat
27. Heat Off Switch: Turns off heat

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 your 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 properly.

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- 528-028-00

Mounting Plate Mat- 790-316-13

Thumbscrew Knob (4) - 562-184-10

Male Connector (E-class only)- 420-359-00

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 nameplate requirements. Allow approximately 2" (5 cm) of clearance around the unit for free air convection, accessory attachments and user convenience. Shakers with refrigeration should be placed near an accessible drain. Route the drainage tube on the back of the unit to this drain.

Electrical Requirements

SHKA4000 and SHKE4000 Series shakers require a 120VAC, 60 Hz 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.

SHKA4000-1CE and SHKE4000-1CE Series shakers require a 220-240VAC, 50/60 Hz 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.

Disconnect the shaker from the power source 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 and operation. 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. Gently slide the flask into its proper position securing it to the wider bottom of the clamp. The spring will hold the neck 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

A-Class Refer to Section 3 for control panel reference.

Power Switch

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

Caution 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. ▲

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.

Time(r)

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.

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

Temp Controller - Setting Temperature

Refer to Figure 5-1 for control panel reference.

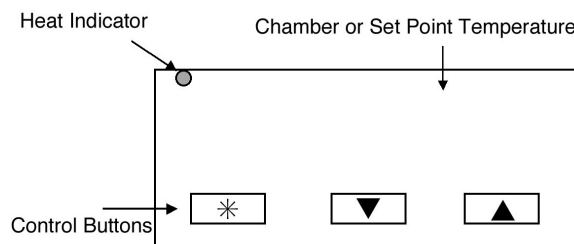


Figure 5-1. Temperature Controller

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.

Press	Controller
*	View set point
* ▲	Decrease set point
* ▼	Increase set point

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 sufficient time for chamber temperature to stabilize.

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. Press and hold the “star” (*) key and using the up or down arrow key, adjust the set point to the desired temperature.
4. Allow the shaker to run until chamber temperature has stabilized.
5. The controller display should now be indicating the set point temperature. Make note of the thermometer reading.
6. 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.
7. Using the examples shown in the table at right 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.
8. 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 $\pm 0.5^{\circ}\text{C}$.
9. Allow the unit to run for at least an additional 30 minutes.
10. 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 6, 7 and 8.

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		

E-Class Refer to Section 3 for control panel reference.

Turning Shaker On

Begin with the shaker power off.

1. Press power switch once (I) to turn on shaker.
2. Press power switch a second time (O) 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. An audible tone will sound before the display lights.

Setting Shaking Speed

1. Hold down appropriate arrow key 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 switch to begin shaking. RPM light will illuminate.
3. Press STOP 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 key until desired rpm is reached. An audible tone will sound before the display lights.

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 get into Calibration mode, hold down 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 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 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.

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 100 ml 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 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 Calibration mode.

Temperature Calibration (cont.)

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 just added is now stored in the nonvolatile memory of the temperature controller.
10. Press HEAT ON button twice to complete return to normal operating mode.

Note It is important to press the HEAT OFF button to exit Calibration mode.

Setting Timer for Timed Shaking

1. Press TIMER/ELAPSED switch 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 switch for desired timing mode.
3. Hold down appropriate arrow switch 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 membrane switch 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 operator presses the Stop button. The TIME display will flash when ELAPSED time reaches 999 minutes or 999 hours.

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.



Figure 5-2. 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”.
8. Verify the program was saved by going to “Start” \ “Programs” \ “Accessories” \ “Communications” \ “HyperTerminal” \ “Max Q Shaker.”
9. This completes the configuration of HyperTerminal. Go to Step 10.

RS232 Communication Configuration (cont.)

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.

Note RS232 Interface Port is for output only. Interface cables must not exceed 9.8’ (3m) in length.

Setting High-Limit Control

The high and low-limit controls are located on the right front side panel of the shaker cabinet (Figure 5-3). The high-limit light is located on the control panel (see Section 3).

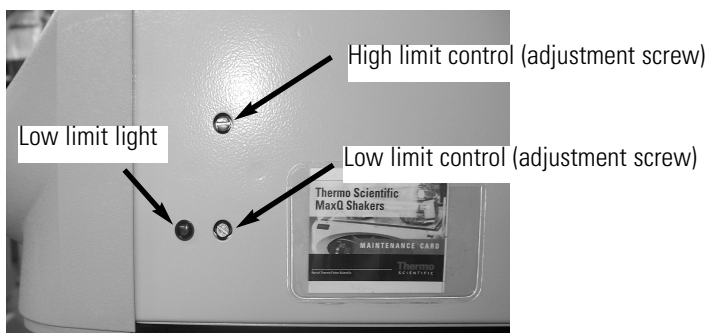


Figure 5-3. Control Limit Locations (Refrigerated Unit Shown)

Note Shakers without optional refrigeration system only have high-limit control on side panel.

1. Make appropriate power connection.
2. Turn power switch ON.
3. 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. Rotate high-limit control slowly counterclockwise until set point is reached.
 - For A-Class shakers 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 turn clockwise beyond this point.

Setting High-Limit Control (continued)

- For E-Class shakers, when set point is reached, high-limit status lamp will flash and the audible alarm will beep once. Rotate the high-limit control slowly clockwise approximately 1/8 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. ▲

Setting Low-Limit Control (Refrigerated)

The high and low limit controls are located on the right front side panel of the shaker cabinet. The high-limit light is located on the control panel. Refer to Figure 5-3. The low-limit control and low limit light are available only on units supplied with optional refrigeration system.

1. Turn ON refrigeration switch located to the left of the defrost timer on the right rear of the shaker cabinet.
2. Rotate low-limit control fully counterclockwise.
3. Set chamber temperature.
4. Allow sufficient time for chamber temperature to stabilize before setting the low-limit control.
5. Rotate low-limit control slowly clockwise. When the set point is reached, low-limit status lamp will illuminate. Rotate the low-limit control slowly counterclockwise until the low-limit status lamp goes out.
6. Continue rotating the low-limit control about 5° of rotation to set it about 1°C to 3°C below the set point, the low-limit status lamp will extinguish and the temperature control status lamp stays lit.
7. When desired temperature is achieved, load the shaker.

Optional Refrigeration System

This section applies only to units supplied with this option. The refrigeration system on the A and E series shakers are identical in operation. Refer to Replacement Parts for refrigeration replacement parts.

When the unit power is on, refrigeration can be initiated by turning ON the refrigeration switch which is located to the left of the defrost timer on the lower right side panel of the shaker cabinet. This should be initiated (turned on) only when a temperature set point of approximately 32°C or less is required (based on your ambient temperatures). Both the main power switch and the refrigeration switch need to be ON for the refrigeration system to work. When the refrigeration switch is activated, the compressor system will run continuously and the system will go through the following routine:

Upon every activation of the refrigeration switch to the ON position, there is an approximate 2-minute delay until the compressor becomes activated. This is a safety feature, to prevent damage to the compressor in the case of quickly switching the refrigeration switch off and on again. Because the compressor does not turn on immediately after switching the refrigeration switch to on, please note, THIS IS NORMAL. The defrost timer will begin initiation. This may turn the fans off for several minutes until it completes a normal defrost cycle.

During operation, the defrost timer will automatically “engage” every 4 hours, switching cold gas through the evaporator (inside) coils to hot gas in order to defrost the coils. There is a dedicated sensor inside the coils which will terminate the defrost when the temperature reaches a point where it is assured that there is no ice or frost on the coil. At low set point temperatures (i.e. 5°C), this defrost time will be longer than higher set point temperatures (i.e. 25°C), which may initiate and terminate immediately because the coils will be much warmer at higher set point temperatures.

Defrost Timer

The defrost timer is located on the lower right side panel of the shaker cabinet to the right of refrigeration power switch and is engaged whenever the refrigeration system is turned on.

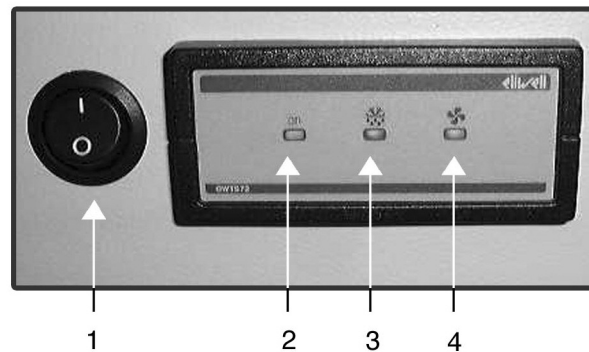


Figure 5-4. Defrost Timer

1. Refrigeration Power Switch - Activates refrigeration system, I is ON, O is OFF.
2. Defrost Time Power Status Lamp (Power) - Timer is powered along with refrigeration system whenever green power status lamp is lit.
3. Defrost Status Lamp (Defrost) - Cooling coil is being defrosted whenever yellow defrost status lamp is ON. Hot gas is being bypassed through the iced coil. When ice on the coil has melted, defrost cycle ends automatically.
4. Fan Delay Status Lamp (Fans) - During defrost timer power-up and after defrost cycle, the circulating fan is locked off for a 1½ minute delay. Green fan status lamp flashes during this fan delay period.

Section 6 Maintenance

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

Note Make no attempt to service or repair a Thermo Scientific product under warranty before consulting your distributor. After the warranty period, such consultation is still advised, especially when the repair may be technically sophisticated or difficult.

If assistance is needed beyond what the distributor can provide, call the Technical Services department. No merchandise, however, should be returned without prior approval.

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.

Gas Springs

Warning Disconnect plug from electrical outlet before attempting any maintenance or repair of the unit. ▲

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. Refer to Figure 6-1.
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.

Replacing Platform Mounting Plate (cont.)

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 plate properly. ▲

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

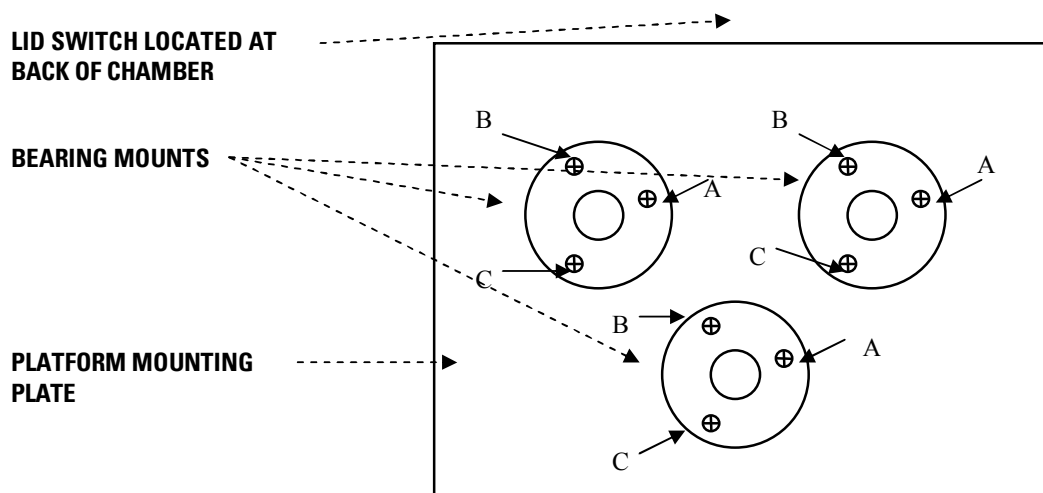


Figure 6-1. Platform Mounting Plate

Platform Maintenance

Suggested with every 3 months of constant use.

Caution Any internal adjustments or repairs must be performed by a qualified service representative. ▲

Remove the platform by loosening 4, thumbscrews in the platform center. Remove the sheet metal panel (9 screws) under the platform to expose the belt and interior parts. Inspect the drive belt for wear. Order a replacement if necessary.

For A-Class Series Only

1. Take out the 2 motor mount screws and lift the motor out.
2. Two brushes are located under plastic caps on opposite sides of the lower part of the motor. Unscrew the plastic caps and slide the brushes out. Replace brushes when they are worn down to 3/16" (0.48 cm) in length.
3. Belt tension is automatically set by the location of the motor and is not adjustable.
4. To align a pulley, loosen the motor pulley set screws, slide the pulley up or down into alignment then securely tighten the motor pulley set screws.

Care and Cleaning of 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.

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.

Care and Cleaning of Acrylic Lid (cont.)

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 7 Troubleshooting

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.
	E-Class, check circuit breaker.	Reset circuit breaker.
	E-Class, check for flashing lights on control panel.	Press any switch on control panel.
	E-Class, check if elapsed timer is flashing.	Reset timer.
	A-Class, check if timer is in off position.	Set timer for continuous or timed operation.
	A-Class, 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.
	A-Class, check for power to speed control.	Replace if defective.
Shaker won't heat	E-Class make sure "HEAT ON" lamp is lit.	Push "HEAT ON" button.

Section 8 Replacement Parts

Catalog Number	Description	Part Number
SHKA4000-5, SHKE4000-5, SHKA4000-6CE, SHKE4000-6CE	Cover H-Temp Assembly	CV1412X2
SHKA4000, SHKA4000-1CE, SHKE4000, SHKE4000-1CE	Cover Assembly	CV1412X1
SHKA4000, SHKE4000, SHKA4000-5, SHKE4000-5	Fan (120V)	FAX29
SHKA4000-5, SHKE4000-6, SHKA4000-5, SHKE4000-5	Fan, 240V Hi-Temp	FAX7
SHKA4000, SHKA4000-1CE, SHKE4000, SHKE4000-1CE	Fan, 240V	FAX7
SHKA4000-1CE, SHKA4000-6CE	Capacitor	310-191-00
ALL SHKA4000 UNITS	Circuit Breaker, 0.5 Amp	330-138-00
ALL SHKA4000 UNITS	Circuit Breaker, 10 Amp, 120V	330-119-00
SHKA4000-1CE, SHKE4000-1CE, SHKE4000-6CE	Circuit Breaker, 5 Amp, 240V	330-118-00
ALL SHKA4000 UNITS	Disc Thermostat	330-397-00
SHKE4000, SHKE4000-1CE, SHKE4000-5, SHKE4000-6CE	Display/time/speed/temp bd	019-536-00
ALL SHKE4000 UNITS	Drive belt	150-288-00
ALL SHKA4000 UNITS	Drive belt	150-318-00
ALL UNITS	Drive Crank	803-632-00
ALL UNITS	Gas Spring	850-117-00
SHKA4000-5, SHKE4000-5	Heater, 120V Hi-Temp	340-398-01
ALL UNITS	Heater, 120V	340-394-00
SHKE4000-5, SHKE4000-6CE	Heater, 240V Hi-Temp	340-398-01
ALL UNITS	Idler	803-633-00
ALL UNITS	Immersible RTD Temp sensor	410-632-00
ALL SHKA4000 UNITS	Knob	560-275-00
ALL SHKA4000 UNITS	Knob, Locking Tab	600-125-00

Section 8
Replacement Parts

Catalog Number	Description	Part Number
ALL SHAKER UNITS	Lamp Base	360-233-01
ALL UNITS (120V)	Line Cord, 120V	319349
ALL UNITS (240V)	Line Cord, CE, 240V	470-305-00
ALL UNITS	Line Cord, UK, 240V	CRX108
ALL UNITS	Line Cord, China, 240V	CRX115
ALL SHKA4000 UNITS	Mini Rocker Switch	440-397-00
ALL SHKE4000 UNITS	Motor	370-390-00
ALL SHKA4000 UNITS	Motor	370-388-00
	Motor replacement brushes for 370-388-00	370-272-01
ALL UNITS	Platform Mat	790-316-13
ALL SHKE4000 UNITS	Power Supply	460-315-00
SHKE4000, SHKE4000-1CE	Program Micro Bd	019-533-04
SHKE4000-5, SHKE4000-6CE	Program Micro Bd	019-533-05
ALL SHKE4000 UNITS	Prwr/Mtr Drive PC BD	019-534-00
ALL SHKA4000 UNITS	Red Lens	360-234-00
ALL SHKA4000 UNITS	Round Power Switch	440-396-00
ALL UNITS	Rubber Foot	790-423-00
ALL UNITS	Shaker Mechanism	019-445-00
ALL UNITS	Solid State Relay	400-233-00
ALL SHKA4000 UNITS 240 VOLT	Speed Control, 240V	229-419-00
ALL SHKA4000 UNITS	Speed Control, 120V	227-598-00
ALL UNITS	SPST Switch	440-080-00
ALL SHKA4000 UNITS	Tach PCB	228-612-00
ALL SHKA4000 UNITS	Tachometer	660-111-00
SHKA4000 RPO	Configured Temp Controller, 120V	CN71X125P
SKKA4000-5 RPO	Configured Temp Controller, 120V	CN71X126P
SHKA4000-7 RPO	Configured Temp Controller, 120V	CN71X125P
SHKA4000-1CE RPO	Configured Temp Controller, 240V	CN71X129P
SHKA4000-6CE RPO	Configured Temp Controller, 240V	CN71X130P
SHKA4000-8CE RPO	Configured Temp Controller, 240V	CN71X131P
ALL UNITS	Thermostat	920-301-00
ALL UNITS	Thumb Screw	562-184-10
ALL SHKA4000 UNITS	Timer	270-135-00
ALL UNITS	Defrost Timer	270-108-00

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 handle 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.

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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

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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.

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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.

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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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