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Thermo Scientific iEMS Incubator/Shaker HT

User Manual

Rev. 2.4



Part of Thermo Fisher Scientific

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Thermo Scientific iEMS Incubator / Shaker HT

User Manual

Rev. 2.4, Cat. no. 1506400A

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Thermo Scientific iEMS Incubator / Shaker HT, Cat. no. 5112250 and 5112257
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Table of Contents

1	Safety Symbols and Markings	7
2	About the User Manual	8
3	Introduction to the iEMS™ Incubator / Shaker HT	9
4	Functional Description	10
5	Installation	14
6	Operation	19
7	Maintenance	34
8	Troubleshooting Guide	39
9	Technical Specifications	44
10	Ordering Information	48
11	Warranty Certificate	49
12	Index	50
13	Glossary and Abbreviations	53
Appendix A:	Thermo Scientific iEMS Incubator / Shaker HT Quick Reference Guide	54
Appendix B:	Certificate of Decontamination	55
Appendix C:	Thermo Scientific iEMS Incubator / Shaker HT Feedback Form	56
Appendix D:	Addresses	57
	Notes	58

Table of Contents

1 Safety Symbols and Markings 7

2 About the User Manual 8

3 Introduction to the iEMS™ Incubator / Shaker HT 9

3.1 Intended use 9

3.2 Principle of operation 9

3.3 Advantages of using iEMS Incubator / Shaker HT 9

4 Functional Description 10

4.1 iEMS Incubator / Shaker HT front view 10

4.2 iEMS Incubator / Shaker HT rear view 11

4.3 Keyboard and display 12

4.4 Thermal microplate holder 13

5 Installation 14

5.1 Installation check list 14

5.2 What to do upon delivery 14

5.2.1 How to unpack 14

5.2.2 Checking delivery for completeness 15

5.2.3 Checking for damage during transport 15

5.2.4 Climatic requirements 15

5.2.5 Things to avoid 15

5.2.6 Technical prerequisites 16

5.3 Setups before you put the instrument into operation 16

5.3.1 Voltage selector 16

5.3.2 Mains supply cable 17

5.3.3 Setup 18

6 Operation 19

6.1 Principle of operation 19

6.2 Programming protocols 20

6.3 Slot status – control LEDs and audio signal 23

6.4 Normal operation 24

6.4.1 Placing the microplate 24

6.4.2 Before pressing start 26

6.4.3 Operation 27

6.4.3.1 Starting the operation 27

6.4.3.2 Checking the operation time 27

6.4.3.3 Starting a program during operation in another slot 27

6.4.3.4 Checking the operation stop time 28

6.4.3.5 Stopping the operation 28

6.4.3.6 Turning off the audio signal 28

6.4.4 Removing the microplate 29

6.5 Preheating and heating 31

6.6 Shaking 32

6.7 Verifying incubation and shaking parameters 33

7 Maintenance ... 34
7.1 Regular and preventive maintenance ... 34
7.1.1 General ... 34
7.1.2 Immediate ... 34
7.2 How to replace fuses ... 35
7.3 Disposal of materials ... 36
7.4 Decontamination procedure ... 36
7.4.1 How to decontaminate the instrument surface ... 37
7.4.2 How to decontaminate the thermal microplate holder ... 37
7.5 How to pack for service ... 38
7.6 Disposal of the instrument ... 38

8 Troubleshooting Guide ... 39
8.1 Limitations ... 39
8.2 Warnings and cautions ... 39
8.2.1 Installation ... 39
8.2.2 General ... 40
8.2.3 Temperature ... 41
8.2.4 Shaking ... 41
8.2.5 Operation ... 42
8.2.6 Maintenance ... 42
8.3 Service request protocol ... 43

9 Technical Specifications ... 44
9.1 General specifications ... 44
9.2 Incubator specifications ... 45
9.3 Shaker specifications ... 45
9.4 Safety specifications ... 46
9.5 In conformity with the requirements ... 47

10 Ordering Information ... 48
10.1 List of accessories and recommended spare parts ... 48

11 Warranty Certificate ... 49
11.1 Warranty limitations ... 49

12 Index ... 50

13 Glossary and Abbreviations ... 53
13.1 Keywords for web pages ... 53

Appendix A: Thermo Scientific iEMS Incubator / Shaker HT Quick Reference Guide ... 54

Appendix B: Certificate of Decontamination ... 55

Appendix C: Thermo Scientific iEMS Incubator / Shaker HT Feedback Form ... 56

Appendix D: Addresses ... 57

Notes ... 58

List of Figures

Fig. 4.1 iEMS Incubator/Shaker HT front view 10
Fig. 4.2 iEMS Incubator/Shaker HT rear view 11
Fig. 4.3 iEMS Incubator/Shaker HT keyboard 12
Fig. 4.4 iEMS Incubator/Shaker HT display 12
Fig. 4.5 Thermal microplate holder 13
Fig. 5.1 Opening the voltage selector/fuse block assembly 16
Fig. 5.2 Selecting the correct voltage 17
Fig. 6.1 Principle of operation 19
Fig. 6.2 Microplate in the thermal microplate holder 24
Fig. 6.3 Inserting the thermal microplate holder into a slot 25
Fig. 6.4 Pushing down the microplate holder to latch it properly 25
Fig. 6.5 Removing the microplate holder – lifting the handle 30
Fig. 6.6 Removing the microplate holder – pulling the holder out 30
Fig. 7.1 Opening the voltage selector/fuse block assembly 35
Fig. 7.2 Fuse block assembly 35

List of Tables

Table 5.1 Installation check list 14
Table 6.1 Speed settings of the shaker 22
Table 6.2 LED color codes 23

1 Safety Symbols and Markings

These symbols are intended to draw your attention to particularly important information and alert you to the presence of hazards as indicated.

Safety symbols and markings used on the iEMS Incubator / Shaker HT

Power ON



Power OFF

SN **Serial number**

REF **Catalog number**



Date of manufacture



Consult Instructions for Use



WEEE symbol This product is required to comply with the European Union's Waste Electrical & Electronic Equipment (WEEE) Directive 2002/96/EC.

Warning markings used in the documentation



Warning: Risk of electric shock.



Warning: Biohazard risk.



Warning: Hot surface, risk of burns.



Warning: Risk of injury to the user(s).



Caution: Risk of damage to the instrument, other equipment or loss of performance or function in a specific application.

Other markings used in the documentation



Note: Marks a tip, important information that is useful in the optimum operation of the system, or an item of interest.

2 About the User Manual

The user manual has been written for the actual end user (for example, laboratory technician) and provides information on the Thermo Scientific iEMS Incubator/Shaker HT, including installation and operating instructions.

Read the manual in its entirety prior to operating the instrument.

The user manual has been designed to give you the information you need to:

- Review safety precautions
- Install the iEMS Incubator/Shaker HT
- Carry out incubating and shaking procedures
- Perform basic maintenance procedures
- Troubleshoot the instrument performance
- Maintain the instrument

The user manual also describes features and specifications of the iEMS Incubator/Shaker HT hardware and onboard software.

Chapter 6 Operation explains the operating procedures.

The user should be familiar with the contents of Chapter 7 on maintenance.

For warranty and ordering information, refer to Chapters 10 Ordering Information and 11 Warranty Certificate.

In an effort to produce useful and appropriate documentation, we appreciate your comments on this document to your local Thermo Fisher Scientific representative.

3 Introduction to the iEMS™ Incubator / Shaker HT

The iEMS Incubator/Shaker HT is available as a one-cabinet model, allowing the capacity of three (3) microplates.

3.1 Intended use

The iEMS Incubator/Shaker HT is a high-quality standalone microplate incubator and orbital shaker intended for laboratory research use by professional personnel. The instrument is used to incubate and shake microplates that meet the SBS standards with a temperature of up to 69°C and a shaking speed of up to 1400 rpm.

For verification of the entire system, it is recommended Good Laboratory Practices (GLP) be followed to guarantee reliable analyses.

Use for self-testing is excluded.

3.2 Principle of operation

The iEMS Incubator/Shaker HT consists of a keyboard and one incubation module with three (3) incubation slots. All slots can be used for processing microplates individually within certain limitations. A control LED above each slot indicates the status of that slot.

The keyboard is used to enter processing parameters and to start thus programmed protocols. These protocols can be the same for all slots or entered individually for each slot. The parameters are stored in the instrument memory until new parameters are entered. It is possible to change the parameters of one slot without affecting the parameters of the other slots.

In one module, all slots have the same incubation temperature and they shake at the same speed. The slots should be preheated to the programmed target temperature before protocols are started.

3.3 Advantages of using iEMS Incubator / Shaker HT

The iEMS Incubator/Shaker HT provides several advantages relating mainly to the principle of operation in that it has:

- Extended temperature range
- Exceptional temperature uniformity across the plate
- Efficient orbital shaking
- Capacity of up to three (3) microplates

4 Functional Description

The iEMS Incubator/Shaker HT offers an extended temperature range up to nearly 70°C. Uniformity of temperature is also excellent at these elevated temperatures ensuring good assay reproducibility.

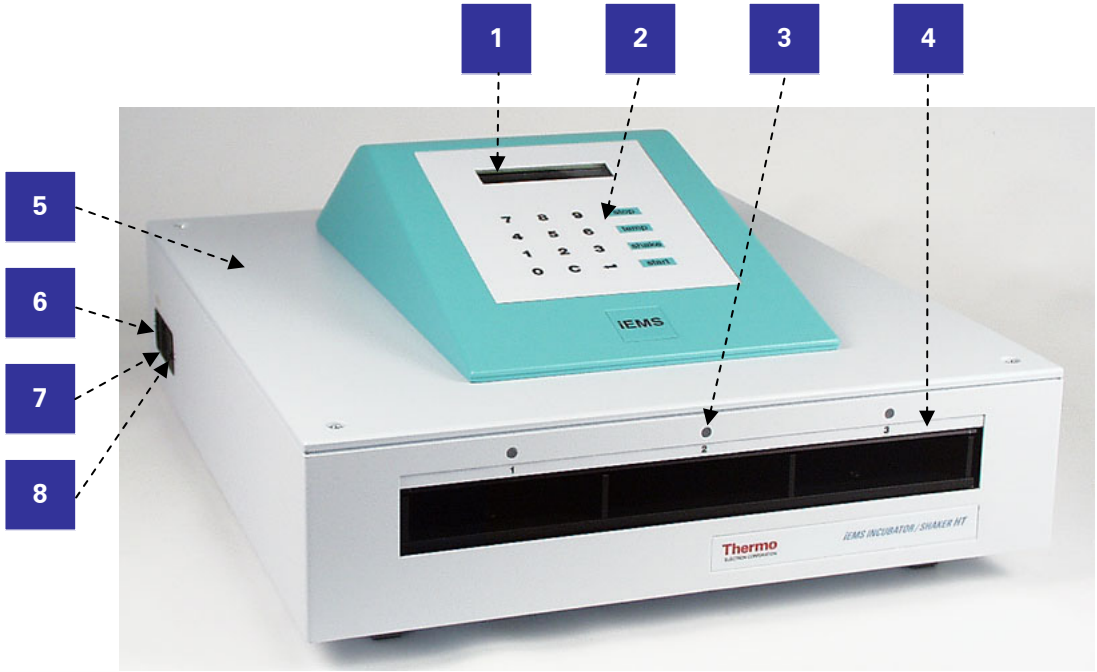
The iEMS Incubator/Shaker HT uses an individual thermal microplate holder designed for ease of use and uniform heating of each microplate. Temperature variation is less than 0.6°C across the microplate. To eliminate temperature gradients and edge effects, microplates are evenly heated from all sides. This ensures assay reproducibility.

Thermal microplate holders are heated electrically via connectors in the plate carrier. An upper heater within the top of the module prevents condensation from forming within the microplate holder.

For effective mixing, a powerful variable-speed orbital shaker is incorporated. Featuring an orbit of 1 mm and speeds from 400 to 1400 rpm in 250 rpm increments, the shaker motion ensures efficient mixing of even very viscous liquids. All slot positions within a module are shaken simultaneously.

Each slot of the iEMS Incubator/Shaker has a control LED (light-emitting diode) that displays the status of the slot. The LED will change to a specific color based on the status of the slot. When the incubation and shaking operations end, the instrument also gives an audio signal.

4.1 iEMS Incubator / Shaker HT front view



1. Display
2. Keyboard
3. Control LED (light-emitting diode)
4. Incubation slot
5. Incubation module with three (3) slots
6. Mains input socket
7. Mains switch
8. Voltage selector and fuses

Fig. 4.1 iEMS Incubator/Shaker HT front view

4.2 iEMS Incubator / Shaker HT rear view



1. Cooling-air inlet
2. DIP switches (*not in use*)
3. Device link RS-485 (*not in use*)
4. Computer RS-232C/device link RS-485 (*not in use*)
5. Cooling-air outlet
6. Type label

Fig. 4.2 iEMS Incubator/Shaker HT rear view

4.3 Keyboard and display

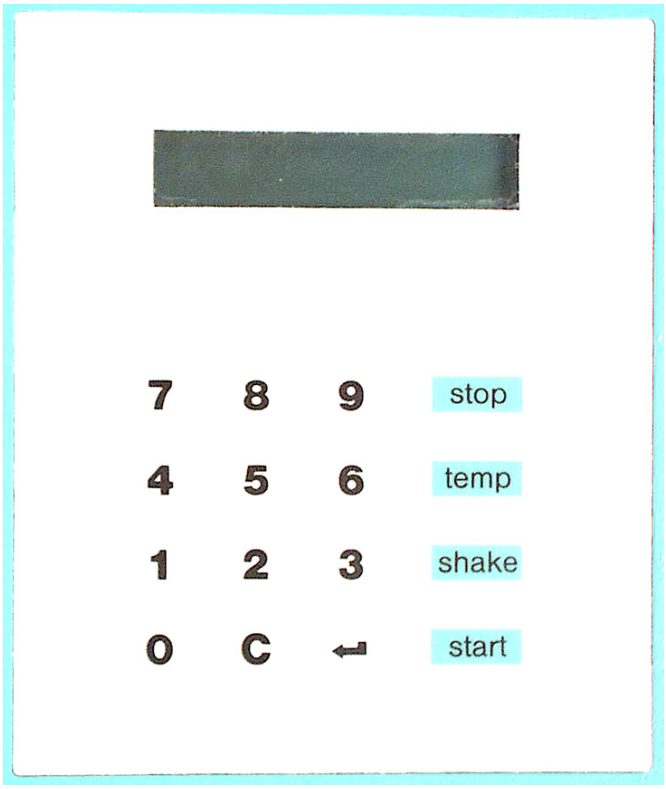


Fig. 4.3 iEMS Incubator/Shaker HT keyboard

Listed below are the functions of the keyboard keys:

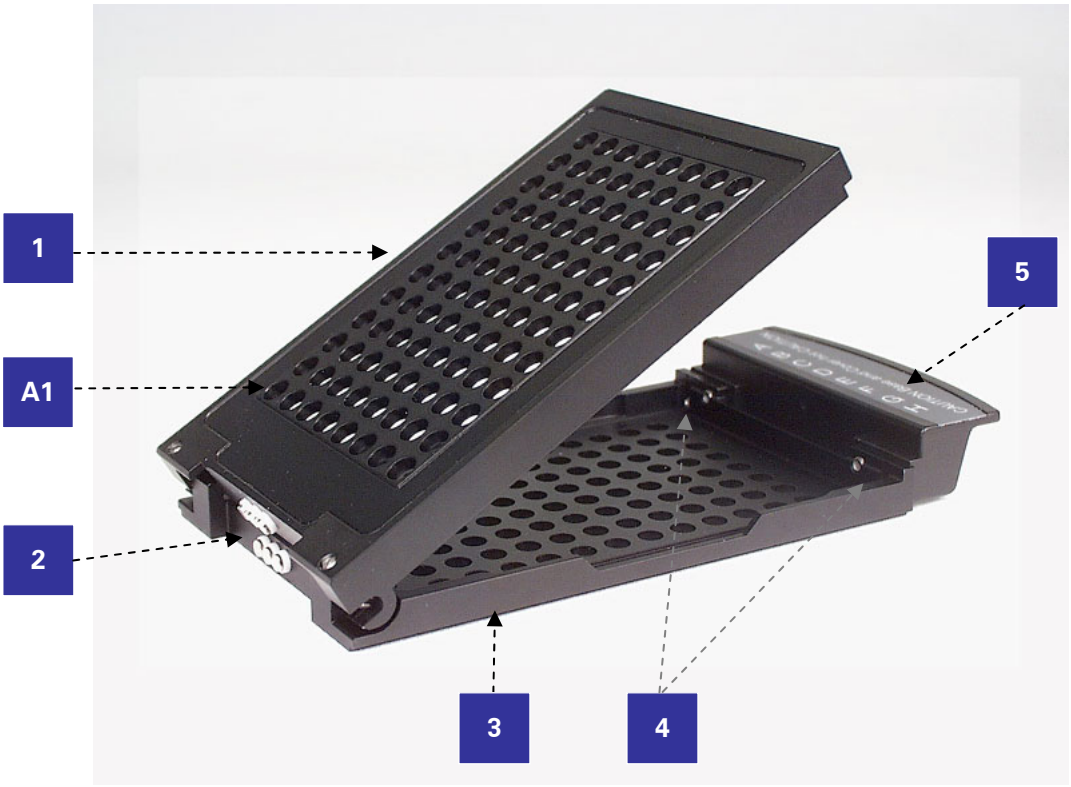
stop	Stops the ongoing operation.
temp	Sets the incubation temperature ON or OFF. Used for starting preincubation (preheating) of the thermal microplate holders to the temperature set in processing protocol parameters.
shake	Starts shaking with the speed and time set in processing protocol parameters.
start	Starts operation defined by processing protocol parameters.
0 – 9	Are used for entering slot numbers and parameter values.
C	Clears an incorrectly keyed numeric value.
↵	Enters a keyed value or continues the program.

TEMPERATURE	**37.0°C**
INC TIME	**00:30:00**

Fig. 4.4 iEMS Incubator/Shaker HT display

The alphanumeric liquid crystal display (LCD) has two (2) lines with up to 20 characters per line.

4.4 Thermal microplate holder



1. Detachable cover with heating element
2. Thermal and sensor contacts
3. Bottom with heating element
4. Adjustment screws
5. Handle

A1 Position of the A1 well on the microplate

Fig. 4.5 Thermal microplate holder

The thermal microplate holder is designed for holding the microplate during the incubation process, ensuring accurate temperature control.

Note: Adjust the screws (Fig. 4.5, item 4) with a screwdriver so that the microplate is held firmly in place during shaking.

Warning: Microplate holders will be hot when touched after use.

5 Installation

5.1 Installation check list

The chapter on installation will contain an outline of the points mentioned in the check list below.

Table 5.1 Installation check list

Tick	Item
❑	Unpack the iEMS Incubator/Shaker HT instrument carefully. Refer to 5.2.1. Keep the original packaging and packing material for future transportation.
❑	Check the delivery for completeness. Refer to 5.2.2.
❑	Check for damage during transport. Refer to 5.2.3.
❑	Place the instrument on a normal laboratory bench, taking into account both the climatic and technical prerequisites. Refer to 5.2.4 and 5.2.6. Leave sufficient clearance on both sides and at the rear of the unit.
❑	Install the instrument. Refer to 5.3.
❑	Connect the mains supply cable to the mains input socket. Refer to 5.3.2.

5.2 What to do upon delivery

5.2.1 How to unpack

Move the unpacked instrument to its site of operation. Unpack the iEMS Incubator/Shaker HT instrument and accessories carefully with the arrows on the transport package pointing upwards. The following notes and instructions are sent with the instrument and are immediately available when you open the package:

- Warranty Certificate card
- packing instructions/packing list
- transportation damage and discrepancy report
- Manufacturing / Quality Report
- *iEMS Incubator/Shaker HT User Manual*



Caution: Do not touch or loosen any screws or parts other than those specially designated in the instructions. Doing so might cause misalignment and will invalidate the instrument warranty.

To lift the instrument, put your fingers under the bottom on both sides and lift it with your back straight.



Caution: When unpacking the instrument, it is recommended two people lift the instrument together, taking proper precautions to avoid injury.

Retain the original packaging and packing material for future transportation. The packaging is designed to assure safe transport and minimize transit damage. Use of alternative packaging materials may invalidate the warranty. Also retain all instrument-related documentation provided by the manufacturer for future use.

5.2.2 Checking delivery for completeness

Check the enclosed packing list against order. In case of any deviations, contact your local Thermo Fisher Scientific representative.

5.2.3 Checking for damage during transport

Visually inspect the transport package, the instrument and the accessories for any possible transport damage.

If the carton has been damaged in transit, it is particularly important that you retain it for inspection by the carrier in case there has also been damage to the instrument.

Neither the manufacturer nor its agents can be held responsible for any damage incurred in transit, but the manufacturer will make every effort to help obtain restitution from the carrier. Upon receipt of the carrier's inspection report, arrangements will be made for repair or replacement.

Visually check all interconnections in the basic instrument. Check that there are no loose parts inside the instrument.

If any parts are damaged, contact your local Thermo Fisher Scientific representative.

5.2.4 Climatic requirements

When you set up your iEMS Incubator/Shaker HT, avoid sites of operation with excess dust, vibrations, strong magnetic fields, direct sunlight, draft, excessive moisture or large temperature fluctuations.

- Make sure the working area is flat, dry, clean and vibration-proof and leave additional room for accessories, cables, reagent bottles, etc.
- Leave sufficient space (at least 10 cm) on both sides and at the back of the unit to allow adequate air circulation.
- Make sure the ambient air is clean and free of corrosive vapors, smoke and dust.
- Make sure the ambient temperature range is between +10°C (50°F) and +40°C (104°F).
- Make sure relative humidity is between 10% and 90% (non-condensing).

The iEMS Incubator/Shaker HT does not produce operating noise at a level that would be harmful. No sound level measurements are required after installation.



Warning: Do not operate the instrument in an environment where potentially damaging liquids or gases are present.

5.2.5 Things to avoid

Do not smoke, eat or drink while using the iEMS Incubator/Shaker HT. Wash your hands thoroughly after handling test fluids. Observe normal laboratory procedures for handling potentially dangerous samples. Use proper protective clothing. Use disposable gloves. Ensure the working area is well ventilated.

Never spill fluids in or on the equipment.

5.2.6 Technical prerequisites

Place the instrument on a normal laboratory bench. The net weight of the instrument is 15 kg [33 lbs.].

The instrument operates at voltages of 100 – 120 Vac, 220 – 240 Vac and the frequency range 50/60 Hz.

5.3 Setups before you put the instrument into operation

5.3.1 Voltage selector

The voltage selector/fuse block assembly (Fig. 5.1) is located on the left-hand side (Fig. 4.1, item 8) of the instrument. Check that the selected voltage corresponds to the local voltage. You can see the current voltage setting through the slit in the fuse holder (Fig. 5.2, item 3).

To change the selected voltage:

1. Remove the power cable from the power inlet.
2. Use a small flat screwdriver to pry the voltage selector/fuse block assembly away from the power entry port housing and remove (Fig. 5.1).

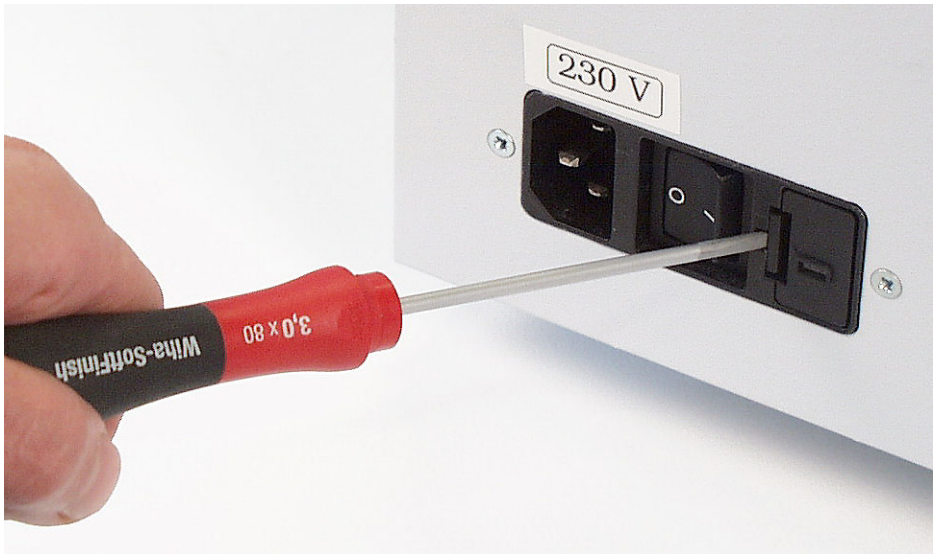
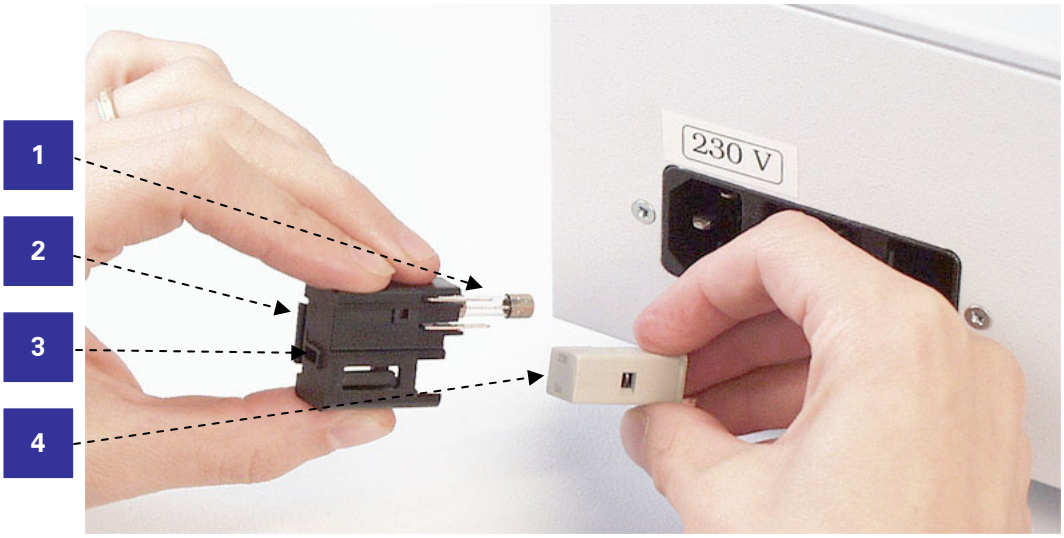


Fig. 5.1 Opening the voltage selector/fuse block assembly

3. Remove the voltage selector module (Fig. 5.2, item 4), rotate it 180° and replace. Make sure the correct voltage value is visible through the slit at the end of the voltage selector/fuse block assembly (Fig. 5.2, item 3).



1. Fuse
2. Fuse holder
3. Slit showing the correct voltage
4. Voltage selector module

Fig. 5.2 Selecting the correct voltage

4. Slide the fuse block assembly back into the power entry port housing. Snap the assembly securely into place.
5. Reinsert the power cable.

5.3.2 Mains supply cable

Warning: Never operate your instrument from a power outlet that has no ground connection. Never use a mains supply cable other than the Thermo Scientific mains supply cable designed for your region.

1. Ensure the mains switch (Fig. 4.1, item 7) at the back of the left side panel is in the **OFF** position.
2. Connect the mains supply cable to the mains input socket (Fig. 4.1, item 6) at the back of the left side panel.
3. Connect the instrument to a correctly installed line power outlet that has a protective conductor that is grounded.

5.3.3 Setup

Power on the instrument. The firmware version is shown on the display.

Set the clock time

1. While in the READY state, press **C** to select the setup menu.
2. Select **1** for clock. Press ↵ (Enter).
3. Program the new time (hh mm ss) and press ↵ (24-hour clock).

The baud rate is used for service purposes only.

If you want to interrupt the setup, press **stop** to return to the READY state.

6 Operation

6.1 Principle of operation

When you power on the instrument, it will be in the READY state. From the READY state you can choose to modify the setup parameters (Section 5.3.3 Setup) or the protocol parameters (Section 6.2 Programming protocols). If you have already programmed protocols, while in the READY state, you can start to preheat the required slots (Section 6.5 Preheating and heating) before starting the operation (Section 6.4.3 Operation). It is also possible to start shaking the slots without heating as a separate function (Section 6.6 Shaking). For an overview of the operations, see Fig. 6.1 below.

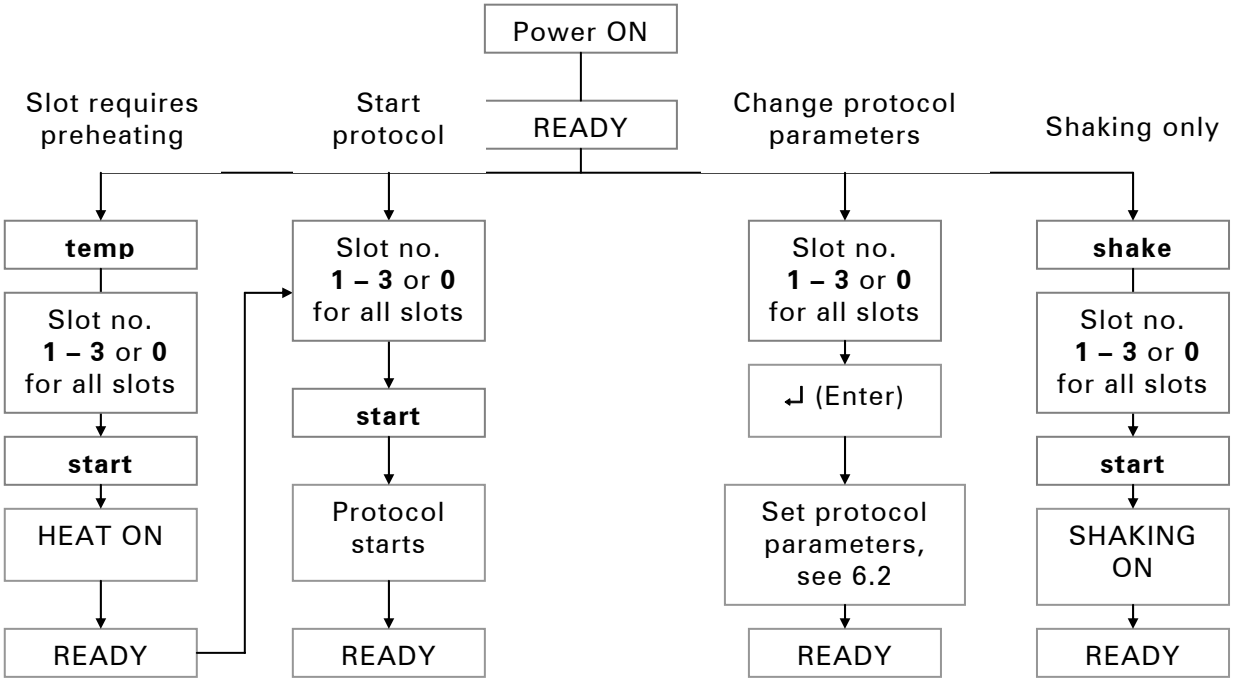


Fig. 6.1 Principle of operation

6.2 Programming protocols

Use the keyboard to enter processing parameters and to start thus programmed protocols. You can program a single protocol for all slots or an individual protocol for each slot. The parameters are stored in the instrument memory until you enter new parameters. You can change the parameters of one slot without affecting the parameters of the other slots.

In one module, all slots have the same incubation temperature and they shake at the same speed. You should preheat the slots to the programmed target temperature before you start any protocol (see Section 6.5 Preheating and heating).

Operation	Display
Switch the power ON.	**READY 09:25:15**

Note: If the power is already on, any shaking or heating must be turned off in the slot to be able to program a protocol.

To program the incubation and shaking parameters, press the appropriate slot number (**1** – **3**). For example,

Operation	Display
Press **1** ↵ (Enter)	**PLACE 1 09:25:15** **TEMPERATURE 37.0ºC**

If you want to program the same parameters to all slots:

Operation	Display
Press **0** ↵	**ALL PLACES** **TEMPERATURE 37.0ºC**

Program the new temperature value by dialing the number keys, or press ↵ (Enter) to accept the existing one.

Note: Check where the cursor (underline) is located before you enter a value. The value will be entered at the location of the cursor.

For example,

Operation	Display
Press **50** ↵	**TEMPERATURE 50.0ºC** **INC TIME 00:00:00**

Note: If you want to interrupt the programming, press **stop** to return to the READY state. Your changes will be saved.

Program the incubation time by dialing the number keys: first hours; then minutes, and finally seconds.

Note: Check where the cursor (underline) is located before you enter a value. The value will be entered at the location of the cursor.

For example, for an incubation time of 1 hour 30 minutes:

Press **01 30 00** ↵

INC TIME	**01:30:00**
SHAKE TIME	**00:00:00**

Note: If you want to interrupt the programming, press **stop** to return to the READY state. Your changes will be saved.

Program the shaking time by dialing the number keys: first seconds; then hours, and finally minutes.

Note: Check where the cursor (underline) is located before you enter a value. The value will be entered at the location of the cursor.

For example, for a shaking time of 20 seconds:

Press **00 00 20** ↵

SHAKE TIME	**00:00:20**
INT TIME	**00:00:00**

Note: If you want to interrupt programming, press **stop** to return to the READY state. Your changes will be saved.

Interval time is a programmable parameter that allows you to specify at what interval the shaking is alternately switched off and on (for example, an interval time of 00:00:10 results in 10 seconds of shaking turned on, 10 seconds of shaking turned off, 10 seconds of shaking turned on, etc.) for the duration of the programmed shaking time.

Program the interval shaking time by dialing the number keys: first minutes; then seconds, and finally hours.

Note: Check where the cursor (underline) is located before you enter a value. The value will be entered at the location of the cursor.

For example, for an interval shaking time of zero:

Press **00 00** ↵ (Enter)

SHAKE TIME	**00:00:20**
INT TIME	**00:00:00**

Note: The slots within a module shake at the speed that is programmed into the most recently started processing protocol. Incorrect shaking speed may result if you start a protocol within the same module that has a shaking speed different from the other slots already in use. To minimize the likelihood of this occurring, it is recommended you program all processing protocols within a module with the same shaking speed.

Caution: Do not place the microplate holder in or remove it from the instrument while the instrument is shaking. This may damage the shaking mechanism.

The shaking speeds corresponding to the values you can enter are shown in the table below:

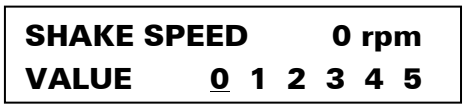
Table 6.1 Speed settings of the shaker

Value	0	1	2	3	4	5
Shake speed (rpm)	0	400	650	900	1150	1400

Caution: Splashing may occur if you use shaking with wells that contain too much liquid for a given speed. To avoid splashing and potential cross contamination from well to well, do not overfill wells for a given shaking speed setting.

When the well is filled to 50% of its nominal volume, the shake speed setting should not exceed value 4. It is recommended to use the setting 3 in most cases.

Program the shaking speed by pressing the appropriate number key corresponding to the required speed. For example, for a speed of 900 rpm:



Press **3** ↵ (Enter)



If no shaking is desired, select the value **0**. In this incubation module, shaking is now disabled in every slot. If you try to start a slot with a protocol with shaking, an error message will appear on the display:



On the display, the READY state will appear after the programming phase.



6.3 Slot status – control LEDs and audio signal

Each slot of the iEMS Incubator/Shaker has a control LED (light-emitting diode) that displays the status of the slot. The LED will change to a specific color based on the status of the slot. An audio signal is given when the green LED is turned on (see Section 6.4.3.6). The colors of the LED are defined in the table below.

Table 6.2 LED color codes

Color code	Explanation
Flashing orange	The heating has been turned on but the set temperature has not yet been reached.
Orange	The slot has reached the set temperature and is ready for operation.
Red	The slot is in use (shaking and/or incubating).
Green	The processing protocol is complete and the heating of the slot is still on.

The orange control LED flashes when a slot is heating up to the programmed target temperature. The LED turns to a continuous orange color when the slot reaches the target temperature. However, the continuous orange LED may falsely indicate that a slot is at the target temperature under the following conditions:

- If you remove the thermal microplate holder and then reinsert it into the slot during the initial preheating of the slot.
- If the programmed target temperature is lower than the actual temperature of the slot.

6.4 Normal operation

6.4.1 Placing the microplate

Caution: To minimize the possibility of splashing, aerosols and evaporation during shaking and incubation, it is recommended you use microplate sealers.

Open the cover of the thermal microplate holder and place the microplate into the thermal microplate holder so that well A1 is located in the upper left corner as shown in Fig. 6.2.

Caution: Do not handle the thermal microplate holder from its cover since it will come off. Use the handle (Fig. 6.2).

Caution: Do not place the microplate holder into the instrument while the instrument is shaking. This may damage the shaking mechanism.

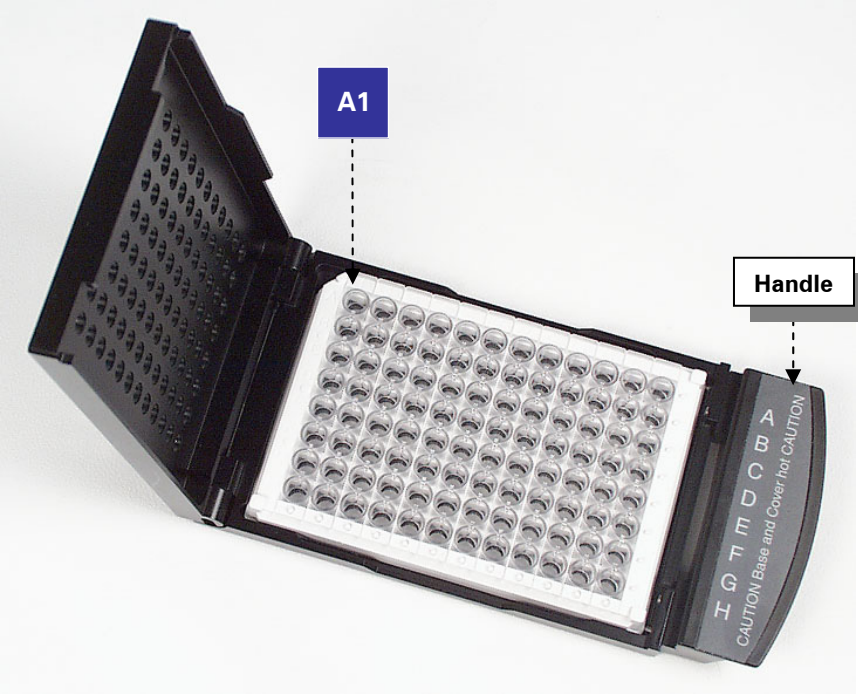


Fig. 6.2 Microplate in the thermal microplate holder

Be careful not to spill the contents of the microplate when you load it into the thermal microplate holder and when you insert the holder into the slot. Carefully insert the plate into the microplate holder and close the cover.

Caution: The covers of the thermal microplate holders are not spring-loaded, but you should take care not to trap your fingers when closing the cover of the holder. Avoid bumping the microplate holder while inserting it into the slot.

When you are inserting a thermal microplate holder into a slot, push the holder completely in (Fig. 6.3) and then down (Fig. 6.4) to latch it into its normal operating position.

Caution: Do not place the microplate holder in or remove it from the instrument while the instrument is shaking. This may damage the shaking mechanism.



Fig. 6.3 Inserting the thermal microplate holder into a slot



Fig. 6.4 Pushing down the microplate holder to latch it properly

Note: If the thermal microplate holder is not latched into position, it may lose contact with the temperature controlling connectors at the rear of the slot.

6.4.2 Before pressing start

Ensure the thermal microplate holder is latched into its normal operating position

Ensure you have inserted the thermal microplate holder correctly into the slot before you start the processing protocol. When inserting a microplate holder into a slot, push the holder completely in and down to latch it into its normal operating position (see Fig. 6.3 and Fig. 6.4). If the microplate holder is not latched into position, it may lose contact with the temperature controlling connectors at the rear of the slot.



Caution: Do not place the microplate holder in or remove it from the instrument while the instrument is shaking. This may damage the shaking mechanism.

Incubator slot preheating

When you power on the instrument, heating of the incubator slots does not occur automatically. You must turn the temperature function on (see Section 6.5 Preheating and heating) after you have powered on the instrument.

Allow the slots to reach the programmed target temperature before you start any processing protocol. The slot has reached the target temperature when the orange LED has stopped flashing and stays continuously orange.

Before you start the processing protocol, ensure the temperature of the slot is within the acceptable range appropriate for the application to be carried out. You can view the actual slot temperature on the instrument display (see Section 6.5 Preheating and heating).

Changing programmed temperature setting

When you change the programmed temperature setting, ensure the slot temperature is at the new target setting before you start the processing protocol. The instrument does not prevent the processing protocol from starting if the slot is not at the target temperature. You can view the actual slot temperatures on the instrument display. Refer to Section 6.5 Preheating and heating.

Module shake speed

All slots within the module will shake at the same speed. The slots within the module shake at the speed that is programmed into the most recently started processing protocol. Incorrect shaking speed may result if you start a protocol within the same module that has a shaking speed different from the other slots already in use. To minimize the likelihood of this occurring, it is recommended you program all processing protocols within a module with the same shaking speed.

6.4.3 Operation

6.4.3.1 Starting the operation



Caution: If the thermal microplate holder is not latched into position, it may lose contact with the temperature controlling connectors at the rear of the slot (see Section 6.4.1 Placing the microplate).

Operation	Display

Press the number of the appropriate slot and then **start** to start the protocol. For example, to start slot 1:

Press **1 start**

PLACE 1

The protocol will start and the LED will light up with a red color.

The READY state appears.

READY	**09:26:30**



Caution: Do not place the microplate holder in or remove it from the instrument while the instrument is shaking. This may damage the shaking mechanism.

6.4.3.2 Checking the operation time

During operation, you can check the remaining incubation time by pressing the slot number. For example,

Press **1**

If the remaining time is 23 minutes and 15 seconds, the display will show:

PLACE 1	
TIME LEFT	**00:23:15**

Press **C** to return to the READY state.

6.4.3.3 Starting a program during operation in another slot

Within a module, if a slot has a protocol in progress with a shaking speed of 0, another protocol with shaking will not start and the display will show:

PLACE 2
PROHIBITED OPERATION



Note: The slots within a module shake at the speed that is programmed into the most recently started processing protocol. For example, if there is a protocol in progress with speed 5 and the adjoining slot is started with speed 3, all slots within the module will shake at speed 3.

Within a module, a second protocol with a programmed temperature different from the protocol already in progress will not start and the display will show:

PLACE 3
PROHIBITED OPERATION

When the protocol is completed, the LED will light up with a green color and you will hear a beeping sound. The heating stays on. For turning off the beeping sound, see Section 6.4.3.6.

6.4.3.4 Checking the operation stop time

Before taking the thermal microplate holder out of the slot, you can check the actual time of day when the incubation stopped. Press the slot number (**1** – **3**).

For example,

Press **1**

PLACE 1	
INC STOP	**09:20:31**

Press **C** to return to the READY state.

If you take the thermal microplate holder out of the slot, you can no longer check the time indicating the stop of the incubation.

6.4.3.5 Stopping the operation

If you press a slot number and **stop** before the processing protocol time elapses, the protocol stops and incubation stays on. The LED will light up with a green color and you will hear a beeping sound. For turning off the beeping sound, see Section 6.4.3.6.

The READY state appears.

READY	**09:27:30**

6.4.3.6 Turning off the audio signal



Caution: Do not place the microplate holder in or remove it from the instrument while the instrument is shaking. This may damage the shaking mechanism.

If you want to turn off the audio signal but wish to continue the incubation, proceed as follows:

1. Make sure the control LED is green and that the module is not shaking.
2. Remove the thermal microplate holder from the slot. The audio signal and the control LED are turned off and the heating of the slot is turned off.
3. Re-insert the microplate holder into the slot. The orange LED is turned on and the heating of the slot turns back on.

If one of the slots has completed the protocol but another slot in the instrument is still shaking, you can turn off the audio signal as follows:

1. Press **shake *n* stop**, where *n* is the slot number that is still shaking. The shaking will be paused.
2. When the shaking is paused, remove the thermal microplate holder from the slot that has completed the protocol. The audio signal and the control LED are turned off and the heating of that slot is turned off.
3. Press **start**. The instrument continues to shake until the programmed time of the other slots in the instrument has elapsed.

If you want to stop the heating and the shaking, but do not want to remove the microplate holder yet from the instrument, proceed as follows:

1. Press **shake *n* stop**. The shaking of the instrument will be paused.
2. Press **temp *n* stop**. The heating of the slot *n* will stop, and the green LED will turn off.
3. Take the microplate holder partly out and put it back in. The audio signal will turn off.

6.4.4 Removing the microplate



Caution: Do not remove the microplate holder from the instrument while the instrument is shaking. This may damage the shaking mechanism.

1. Wait until the slot's control LED is green and you hear the audio signal. The processing protocol is complete, but the heating of the slot is still on. If you wish to turn the heating off, press the slot number (**1** – **3**) and then press **stop**.



Note: Do not remove the thermal microplate holder until the incubation time has elapsed. If you remove the microplate holder from the slot before the incubation time has elapsed, the incubation timer does not stop and continues to count down causing tracking of actual incubation time to be lost.

2. After the shaking and incubation have been completed, you can remove the thermal microplate holder: lift the handle upwards (Fig. 6.5) and pull out (Fig. 6.6). Be careful not to spill the contents of the microplate when you take the microplate holder out of the slot and when you remove the microplate from the holder.



Warning: The thermal microplate holder will be hot after use. Only move the microplate holder from its handle (Fig. 6.2). Use protective gloves when opening the cover and removing the microplate.



Note: If one of the slots has completed the protocol but another slot in the instrument is still shaking, you can pause the shaking as follows:

Press **shake *n* stop**, where *n* is the slot number that is still shaking. The shaking will be paused. When the shaking is paused, remove the thermal microplate holder from the slot that has completed the protocol.

Press **start**. The instrument continues to shake until the programmed time of the other slots in the instrument has elapsed.



Fig. 6.5 Removing the microplate holder – lifting the handle



Fig. 6.6 Removing the microplate holder – pulling the holder out

3. Place the microplate holder on a heat resistant surface. Open the cover and remove the microplate.

Warning: The thermal microplate holders are designed to stop heating if temperatures reach 80°C ± 5°C in the unlikely event that temperature control to a holder is lost or enters a runaway condition. Microplate holders at this temperature will be hot when touched. To help prevent loss of temperature control, ensure the power contacts on the back of the microplate holder are clean and free from dirt or corrosion and that the holder is correctly inserted into the slot before you start the processing protocol.

Instrument reset due to power loss

If the power to the instrument is lost, the instrument will reset to the READY mode when power is restored. All shaking and incubation functions, including timing, will be turned off. No LEDs will be lit and the current time of day will be shown on the display.

6.5 Preheating and heating

Operation	Display

Press **temp** followed by the slot number to display the temperature in a particular slot, or to start the preheating of the thermal microplate holders.

Press **temp**

```
PLACE NUMBER
```

Press the slot number (**1** – **3**). For example,

Press **1**

```
PLACE 1      SET 30.0ºC
HEAT OFF     TRUE 25.7ºC
```

The actual (TRUE) slot temperature and heating status (HEAT OFF or HEAT ON) are displayed.

```
PLACE 1      SET 30.0ºC
HEAT ON      TRUE 37.0ºC
```

If the thermal microplate holder is not installed or inserted correctly, the display will show:

```
PLACE 1      SET 30.0ºC
HEAT ON      TRUE ##.#ºC
```

Press **start** to turn the heating on.

Press **stop** to turn the heating off.

Press a number key or ↵ (Enter) to move to another slot.

Before the temperature has reached the set value, the LED flashes with an orange color. After the temperature has reached the set value, the orange LED lights up continuously.

Press **temp 0** to display the heating status of all slots.

If the heating is ON in every slot, the display will show:

```
PLACES 1-3
HEAT ON
```

If the heating is OFF in every slot, the display will show:

```
PLACES 1-3
HEAT OFF
```

If some slots are ON and some are OFF, the display will show:

```
PLACES 1-3
HEAT ON/OFF
```

At this point, press **start** to turn the heating ON in all slots, or press **stop** to turn the heating OFF in all slots.

Press **C** to return to the READY state.

```
READY        09:29:10
```



Warning: Microplate holders will be hot when touched after use.

6.6 Shaking

Caution: Do not place the microplate holder in or remove it from the instrument while the instrument is shaking. This may damage the shaking mechanism.

Caution: Splashing may occur if you use shaking with wells that contain too much liquid for a given speed. To avoid splashing and potential cross contamination from well to well, do not overfill wells for a given shaking speed setting.

When the well is filled to 50% of its nominal volume, the shake speed setting should not exceed value 4. It is recommended to use the setting 3 in most cases.

Operation	Display

You can activate shaking without heating as a separate function by pressing the **shake** key:

Press **shake**

PLACE NUMBER

Press the slot number (**1** – **3**). For example,

Press **1**

PLACE 1	
900 rpm	**00:00:20**

To start shaking, press **start**.

The shaking time and speed are the same as the parameters set in the programming phase.

After pressing **shake**, you can select the slot numbers by pressing number keys or by scrolling with the ↵ (Enter) key.

Within a module, if a slot has a protocol in progress with a shaking speed of 0, another protocol with a nonzero shaking speed will not start, and the display will show:

PLACE 2
PROHIBITED OPERATION

After the shaking protocol has finished, the control LED turns to green, and you will hear a beeping sound.

READY	**09:29:35**

To *stop* shaking before the shaking time has elapsed:

Press the slot number and the **stop** key.

The protocol stops, the LED turns to green, and you will hear a beeping sound.

Operation	Display
To *pause* shaking:	
Press **shake**	**PLACE NUMBER**
After pressing **shake**, select the slot number by pressing number keys or by scrolling with the ↵ key.	
For example, press **1**	**PLACE 1** **900 rpm 00:00:20**
Press **stop**	**PLACE 1** **SHAKE PAUSED**
To *go on* with shaking:	
Press **start** and the program returns to the READY state.	
Press **C** to return to the READY state if you do not need to start a shake.	**READY 09:29:15**

6.7 Verifying incubation and shaking parameters

You can display the parameters programmed for each slot. To display the programmed parameters, press the appropriate slot number and then press ↵ (Enter). Continue to press ↵ to display the programmed parameters for temperature, incubation time, shake time, interval time and shake speed.



Caution: You can only view programmed incubation and shaking parameters of a slot while the slot is not heating or shaking. When you review the parameters, ensure you do not make any unintentional changes to the programmed values.

7 Maintenance



Warning: To prevent electric shock, turn the power off to the instrument and unplug the power cable during maintenance procedures.

7.1 Regular and preventive maintenance

7.1.1 General

Routine and service procedures must be performed by the user to prevent unnecessary wear or hazards and are described below at the frequency with which they should be applied.

For reliable daily operation, keep the instrument free of dust and spills from liquids. It is also advisable to cover the instrument with the dust cover supplied when not in use. In the event of any damage, contact your local Thermo Fisher Scientific representative for service.

Abrasive cleaning agents are not recommended, because they are likely to damage the paint finish.

It is recommended you clean the case of the instrument periodically to maintain its good appearance. A soft cloth dampened in a warm, mild detergent solution will be sufficient.

Clean the outside of the instrument and the thermal microplate holder with clean low-pressure compressed air or a cloth dampened with water or a mild detergent when necessary.



Caution: Painted surfaces can be cleaned with most laboratory detergents. Dilute the cleaning agent as recommended by the manufacturer. Do not expose painted surfaces to concentrated acids or alcohols for prolonged periods of time as damage may occur.

Clean the keyboard with a mild laboratory detergent.

Plastic covers and surfaces can be cleaned with a mild laboratory detergent or alcohol.



Warning: If any surfaces have been contaminated with biohazardous material, a mild sterilizing solution should be used. See Section 7.4.

Periodically inspect the connectors on the thermal microplate holders for dirt or corrosion. If dirty or corroded, wipe the connectors with a soft cloth slightly dampened with water.

7.1.2 Immediate

Wipe up all spills of liquids immediately from all surfaces of the instrument to prevent leakage into the electronics and mechanics of the instrument. Clean and decontaminate the surfaces if necessary.

Although the iEMS Incubator/Shaker HT is constructed from high-quality materials, you must immediately wipe away spilled saline solutions, solvents, acids or alkaline solutions from outer surfaces to prevent damage, and wipe with deionized distilled water.

7.2 How to replace fuses

The fuses are located on the left side of the instrument (Fig. 4.1, item 8).

1. Switch the instrument OFF. Unplug the instrument and disconnect the power cable from the power input socket.
2. Use a small flat screwdriver to pry the voltage selector/fuse block assembly away from the power entry port housing and remove (Fig. 7.1).

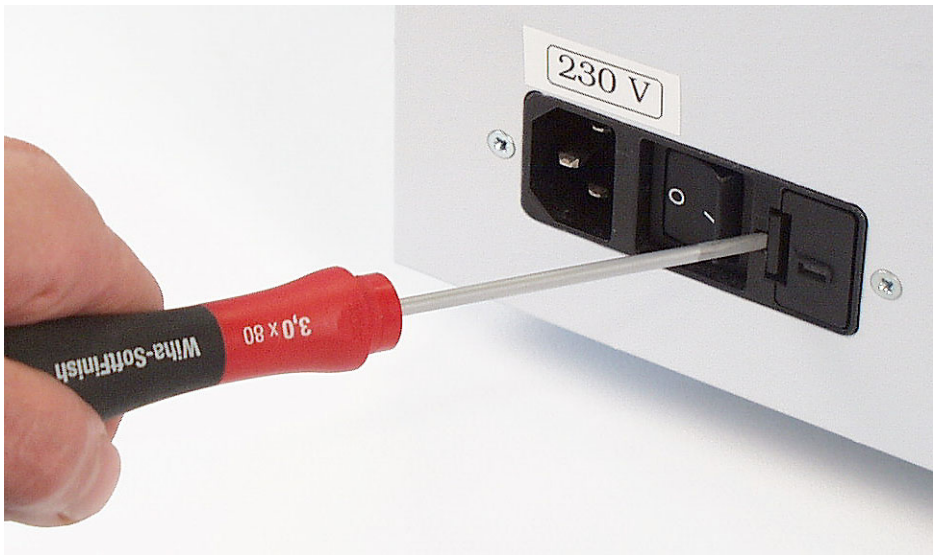
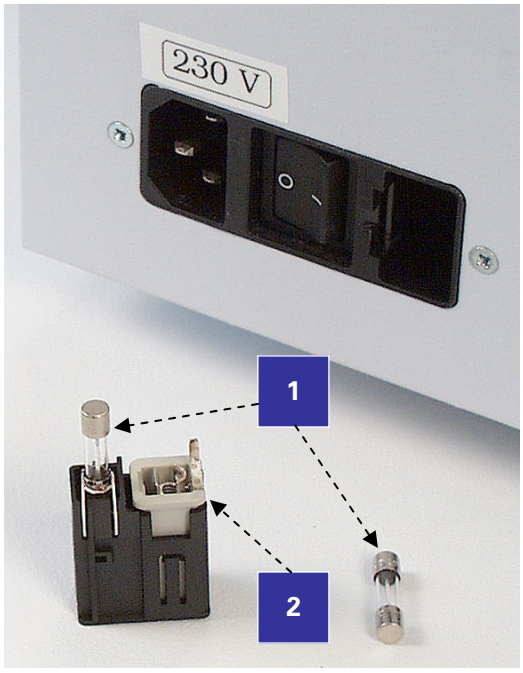


Fig. 7.1 Opening the voltage selector/fuse block assembly

3. Replace the blown fuses with the same type (3.0 A). See Fig. 7.2.



1. Fuses
2. Voltage selector

Fig. 7.2 Fuse block assembly

4. Place the fuse holder back into the slot and push it in until you hear a click.
5. Connect the power cable to the instrument and switch it ON.

7.3 Disposal of materials

Refer to local regulations for the disposal of infectious material.



Warning: The samples can be potentially infectious. Dispose of all used microplates, disposable gloves, syringes, disposable tips, etc. as biohazardous waste.

7.4 Decontamination procedure



Caution: Only use a cloth dampened with a decontaminant to decontaminate the instrument. The use of spraying may damage the instrument.



Warning: To prevent electric shock, do not reach into a slot and/or touch the power contacts at the rear of the slot when the power is turned on to the instrument. If you need to access the slot (for example, for cleaning), turn the power off to the instrument and unplug the power cable.

Decontamination should be performed in accordance with normal laboratory procedures. Any decontamination instructions provided with the reagents used should be followed.

A decontamination procedure is only recommendable when infectious substances have been in direct contact with any part(s) of the instrument.

If there is any risk of contamination with biohazardous material, the procedure recommended below or some other corresponding decontamination procedure must be performed.

It is strongly recommended the complete decontamination procedure is performed before relocating the instrument from one laboratory to another. Refer to Section 7.5 How to pack for service.

Decontamination is not required for the proper functioning of the instrument.

Example of decontaminants

- Ethanol 70%
- Virkon solution 1 – 3%
- Glutaraldehyde solution 4%
- Chloramine T
- Microcide SQ 1:64



Caution: If local or laboratory regulations prescribe regular decontamination, it is not advisable to use formaldehyde, since even small traces of formaldehyde affect the enzyme being used in EIA tests in a negative way resulting in bad test results.



Warning: Always use disposable gloves and protective clothing and operate in a well-ventilated area.

7.4.1 How to decontaminate the instrument surface

In the event of spills of infectious agents on the surfaces of the instrument, perform the following decontamination procedure:

1. Switch the power off and unplug the instrument.
2. Use disposable gloves.
3. Absorb the spill with disposable towels.
4. Dampen a disposable towel with 2% glutaraldehyde containing decontaminating solution and clean the surfaces of the instrument.
5. Place the disposable towels into a biohazard container. [1, 2]

7.4.2 How to decontaminate the thermal microplate holder

In the event of spills of infectious agents on the surfaces of the thermal microplate holder, perform the following decontamination procedure:



Warning: Microplate holders will be hot when touched after use. Allow the holder to cool down prior to performing the decontamination procedure.

1. Use disposable gloves.
2. Absorb the spill with disposable towels.
3. Dampen a disposable towel with 2% glutaraldehyde containing decontaminating solution and clean the surfaces of the thermal microplate holder.
4. Place the disposable towels into a biohazard container.

If the abovementioned cleaning procedure is insufficient because of the extensiveness of the spill of infectious agent, perform the following decontamination procedure:

1. Place the thermal microplate holder into a container containing decontaminating solution with 2% glutaraldehyde for 30 minutes (or according to the directions provided by the manufacturer of the disinfectant solution).
2. Rinse the thermal microplate holder with water.

[1] Ref. National Committee for Clinical Laboratory Standards. Protection of Laboratory Workers from Infectious Disease Transmitted by Blood, Body Fluids and Tissue; Tentative Guideline. NCCLS Document M29-T2, Vol. 11 No. 14. Villanova, Pa.: NCCLS; 1991.
[2] Ref. National Committee for Clinical Laboratory Standards. Protection of Laboratory Workers from Instrument Biohazards; Proposed Guideline. NCCLS Document I17-P, Vol. 11 No. 15. Villanova, Pa.: NCCLS; 1991.

7.5 How to pack for service

When you ship the instrument for service remember to:

- Inform about the use of hazardous materials.
- Decontaminate the instrument beforehand.
- Pack the instrument according to the enclosed packing instructions.
- Use the original packaging to ensure no damage will occur to the instrument during shipping. Any damage will incur additional labor charges.
- Enclose a dated and signed Certificate of Decontamination (see Appendix B) both inside and attached to the outside of the package, in which you return your instrument (or other items).
- Enclose the return authorization number (RGA) given by your Thermo Fisher Scientific representative.
- Indicate the fault after you have been in touch with your local Thermo Fisher Scientific representative or the Thermo Fisher Scientific technical service department.

See Section 9.1 for details on storage and transportation temperatures. See also Section 8.3 Service request protocol.

7.6 Disposal of the instrument



Warning: Decontaminate the instrument prior to disposal. See Section 7.4 and Appendix B on decontamination.

Follow laboratory and country-specific procedures for biohazardous or radioactive waste dispoal.



Warning: The used batteries are regulated waste and must be disposed of according to local waste regulations. The Li batteries have to be changed by an authorized service technician only. Instructions for changing the Li batteries are described in the service manual.

Dispose of the instrument according to the legislation stipulated by the local authorities concerning take-back of electronic equipment and waste. The proposals for the procedures vary by country.



WEEE symbol Thermo Fisher Scientific has contracted with one or more recycling/disposal companies in each EU Member State (European Country), and this product should be disposed of or recycled through them. Further information on Thermo Fisher Scientific's compliance with these Directives, the recyclers in your country, and information on Thermo Scientific products which may assist the detection of substances subject to the RoHS Directive are available at **www.thermo.com/WEEERoHS**.

Regarding the original packaging and packing materials, use the recycling operators known to you.

For further information, contact your local Thermo Fisher Scientific representative.

8 Troubleshooting Guide



Warning: Do not use the instrument if it appears that it does not function properly.

8.1 Limitations

Control LEDs

The orange control LED (light-emitting diode) flashes when a slot is heating up to the programmed target temperature. Refer to Section 6.3 for information. The LED turns to a continuous orange color when the slot reaches the target temperature. However, the continuous orange LED may falsely indicate that a slot is at the target temperature under the following conditions:

- If you remove the thermal microplate holder and then reinsert it into the slot during the initial preheating of the slot.
- If the programmed target temperature is lower than the actual temperature of the slot.

Incubator slot preheating

When you power on the instrument, heating of the incubator slots does not occur automatically. You must turn the temperature function on (Preheating) after you have powered on the instrument. Refer to Section 6.5.

Module incubation temperature

All slots within a module will be heated to the same temperature. The slots within a module are kept at the temperature that is programmed into the first started processing protocol in the module. If another temperature is programmed to another slot in the same module, the program cannot be started. The message PROHIBITED OPERATION will display. Refer to Section 6.4.3.

Module shake speed

All slots within a module will shake at the same speed. The slots within a module shake at the speed that is programmed into the most recently started processing protocol. Refer to Section 8.2.4.

Do not place the microplate holder in or remove it from the instrument while the instrument is shaking. This may damage the shaking mechanism.

8.2 Warnings and cautions

8.2.1 Installation

When unpacking the instrument, it is recommended two people lift the instrument together, taking proper precautions to avoid injury.

Do not touch or loosen any screws or parts other than those specially designated in the instructions. Doing so might cause misalignment and will invalidate the instrument warranty.

Do not operate the instrument in an environment where potentially damaging liquids or gases are present.

Never operate your instrument from a power outlet that has no ground connection. Never use a mains supply cable other than the mains supply cable designed for your region.

8.2.2 General

Thermal microplate holders

Microplate holders will be hot when touched after use.

Do not handle the thermal microplate holder from its cover since it will come off.

The covers of the thermal microplate holders are not spring-loaded, but you should take care not to trap your fingers when closing the cover of the holder.

Avoid bumping the microplate holder while inserting it into the slot.

Viewing programmed processing parameters

You can only view programmed processing parameters while in the programming mode. When you review the parameters, ensure you do not unintentionally change the programmed values. Refer to Section 6.7.

Splashing from overfilled wells

Splashing may occur if you use shaking with wells that contain too much liquid for a given speed. To avoid splashing and potential cross contamination from well to well, do not overfill wells for a given shaking speed setting.

When the well is filled to 50% of its nominal volume, the shake speed setting should not exceed value 4. It is recommended to use the setting 3 in most cases. Refer to Section 6.2.

Splashing, aerosols and evaporation

To minimize the possibility of splashing, aerosols and evaporation during shaking and incubation, it is recommended you use microplate sealers.

Spills

Wipe up all spills of liquids immediately from all surfaces of the instrument to prevent leakage into the electronics and mechanics of the instrument. Clean and decontaminate the surfaces if necessary. Refer to Section 7.1.2.

Incubation time

Do not remove the thermal microplate holder until the incubation time has elapsed. If you remove the microplate holder from the slot before the incubation time has elapsed, the incubation timer does not stop and continues to count down causing tracking of actual incubation time to be lost. Refer to Section 6.4.3.6.

During shaking

Do not place the microplate holder in or remove it from the instrument while the instrument is shaking. This may damage the shaking mechanism.



Do not reach into slot when power is turned on

To prevent electric shock, do not reach into a slot and/or touch the power contacts at the rear of the slot when the power is turned on to the instrument. If you need to access the slot (for example, for cleaning), turn the power off to the instrument and unplug the power cable.



High temperatures

The thermal microplate holders are designed to stop heating if temperatures reach 85°C ± 5°C in the unlikely event that temperature control to a microplate holder is lost or enters a runaway condition. Microplate holders at this temperature will be hot when touched. To help prevent loss of temperature control, ensure the power contacts on the back of the microplate holder are clean and free from dirt or corrosion and that the holder is correctly inserted into the slot before you start the processing protocol.

8.2.3 Temperature

Changing programmed temperature setting

When you change the programmed temperature setting, ensure the slot temperature is at the new target setting before you start the processing protocol. The instrument does not prevent the processing protocol from starting if the slot is not at the target temperature. You can view the actual slot temperatures on the instrument display. Refer to Section 6.5.

Slot warmup time

Allow the slots to reach the programmed target temperature before you start any processing protocol. The slot has reached the target temperature when the orange LED has stopped flashing and stays continuously orange. Refer to Section 6.3.

Slot temperature

Before you start the processing protocol, ensure the temperature of the slot is within the acceptable range appropriate for the application to be carried out. You can view the actual slot temperature on the instrument display. Refer to Section 6.5.

8.2.4 Shaking

Module shake speed set by the most recently started processing protocol

The slots within a module shake at the speed that is programmed into the most recently started processing protocol. Incorrect shaking speed may result if you start a protocol within the same module that has a shaking speed different from the other slots already in use. To minimize the likelihood of this occurring, it is recommended you program all processing protocols within a module with the same shaking speed. Refer to Sections 6.2 and 6.4.3.3.

During shaking

Do not place the microplate holder in or remove it from the instrument while the instrument is shaking. This may damage the shaking mechanism.

8.2.5 Operation

Ensure the thermal microplate holder is latched into its normal operating position

Ensure you have inserted the thermal microplate holder correctly into the slot before you start the processing protocol. When inserting a microplate holder into a slot, push the holder completely in and down to latch it into its normal operating position. If the microplate holder is not latched into position, it may lose contact with the temperature controlling connectors at the rear of the slot. Refer to Section 6.4.1.

Instrument reset due to power loss

If the power to the instrument is lost, the instrument will reset to the READY mode when the power is restored. All shaking and incubation functions, including timing, will be turned off. No LEDs will be lit and the current time of day will be shown on the display.

During shaking

Do not place the microplate holder in or remove it from the instrument while the instrument is shaking. This may damage the shaking mechanism.

8.2.6 Maintenance



Turn power off and unplug instrument during maintenance procedures

To prevent electric shock, turn the power off to the instrument and unplug the power cable during maintenance procedures.

Dirty thermal microplate holder contacts

Ensure the power contacts on the back of the thermal microplate holder are clean and free from dirt or corrosion. Dirty contacts may affect temperature control of the microplate holder in the slot.

Corrosive materials

Do not use corrosive materials during maintenance procedures. Refer to Chapter 7 Maintenance in this manual for information on maintenance procedures.

Painted surfaces can be cleaned with most laboratory detergents. Dilute the cleaning agent as recommended by the manufacturer. Do not expose painted surfaces to concentrated acids or alcohols for prolonged periods of time as damage may occur.

Decontamination

Microplate holders will be hot when touched after use. Allow the holder to cool down prior to performing the decontamination procedure.

If any surfaces have been contaminated with biohazardous material, a mild sterilizing solution should be used. See Section 7.4.

The samples can be potentially infectious. Dispose of all used microplates, disposable gloves, syringes, disposable tips, etc. as biohazardous waste.

Only use a cloth dampened with a decontaminant to decontaminate the instrument. The use of spraying may damage the instrument.

If local or laboratory regulations prescribe regular decontamination, it is not advisable to use formaldehyde, since even small traces of formaldehyde affect

the enzyme being used in EIA tests in a negative way resulting in bad test results.

Always use disposable gloves and protective clothing and operate in a well-ventilated area.

Decontaminate the instrument prior to disposal. See Section 7.4 and Appendix B on decontamination.

8.3 Service request protocol

If the iEMS Incubator/Shaker HT requires service, contact your local Thermo Fisher Scientific representative or the Thermo Fisher Scientific technical service department. Do not under any circumstances send the instrument for service without any prior contact. It is imperative to indicate the fault and nature of the required service. This will ensure a faster return of the instrument to the customer.

Your local Thermo Fisher Scientific representative or distributor will take care of sending a complaint form (that is, the Warranty Claim Technical Sheet) to the Thermo Fisher Scientific technical service department. The Warranty Claim Technical Sheet contains a more detailed description of the fault, symptom or condition. Give all the necessary information to the distributor, who will fill out and forward the Warranty Claim Technical Sheet to the Thermo Fisher Scientific technical service department.

Check Section 7.5 How to pack for service. You will find instructions on how to proceed before shipping the instrument for service.

Check that any necessary decontamination procedure has been carried out before packing. See Section 7.4 Decontamination procedure. Ensure the Certificate of Decontamination (see Appendix A) as well as the return authorization number (RGA) are sent with the instrument.

The Thermo Fisher Scientific technical service department will keep you up to date with the progress of service and provide you with any further details you might need, for example, on maintenance, serviceability, troubleshooting and replacement.

9 Technical Specifications

9.1 General specifications

General specifications	
Overall dimensions	400 mm (W) x 450 mm (D) x 200 mm (H) 15.7 in. (W) x 17.7 in. (D) x 7.8 in. (H)
Weight (total)	15 kg [33 lbs.]
Mains power supply	100 – 120 Vac, 50/60 Hz, nominal 200 – 240 Vac, 50/60 Hz, nominal
Power consumption	230 VA max.
Heat dissipation	785 BTU max.
Fuses	2 x 3.0 A/250 V, UL198G Time Delay, 5 x 20 mm IEC 127-3/III
Operating conditions (indoor use)	+10°C – +40°C, RH 90%
Transportation conditions	-40°C – +70°C, packed in transport packaging
Storage conditions	-25°C – +50°C, packed in transport packaging
Microplate dimensions	Maximum 86 mm (W) x 128 mm (L) x 15 mm (H)
Device interfaces	1. Serial RS-232C interface for computer 2. Serial RS-485 interface for other device link

9.2 Incubator specifications

Performance of the incubator with flat-bottomed microplates with nominal voltages:	
Programmable temperature range	+14°C – +69°C
Controlled incubation range	Ambient plus 3°C to +69.0°C
Resolution	0.1°C
Programmable incubation time	Up to 48 hours in steps of 1 second
Slot warmup time	< 35 minutes to reach a 65°C ± 1.0°C target temperature when starting from ambient temperature (approx. 24°C) (on an average 95% of setting value, with 200 µl water/well, with a plate sealer at nominal voltage)
Inaccuracy	± 0.5°C (calculated as the mean of the minimum and maximum well temperatures of wells A1, A12, H1, H12 and E7, after 1 hour at +65°C, with an ambient temperature of 24°C, with 200 µl water/well, with a plate sealer, and without shaking)
Uniformity	< 0.6°C across the entire plate (calculated as the difference between the maximum and minimum well temperatures of wells A1, A12, H1, H12 and E7, after 1 hour at 65°C, with an ambient temperature of 24°C, with 200 µl water/well, with a plate sealer, and without shaking)
Evaporation	≤ 300 mg/plate after 1 hour (at 37°C, without plate sealer)

9.3 Shaker specifications

Performance of the shaker with flat-bottomed microplates with nominal voltages:	
Frequency	400 –1400 revolutions per minute (rpm) in steps of 250 rpm
Speed settings	0 = 0 rpm 1 = 400 rpm 2 = 650 rpm 3 = 900 rpm 4 = 1150 rpm 5 = 1400 rpm
Tolerance	± 50 rpm
Diameter	1 mm (radius 0.5 mm)
Programmable shaking time	Up to 48 hours in steps of 1 second
Programmable interval time	Up to 48 hours in steps of 1 second

9.4 Safety specifications

iEMS Incubator/Shaker HT fulfills the following requirements:
EN 61010-1:1993 + A2:1995/IEC 61010-1:1990 + A1:1992 + A2:1995 including CENELEC Common Modifications, US and CA National differences
EN 61010-2-010:1994 + A1:1996 including CENELEC Common Modifications, US and CA National differences
EN 61010-1:2001 (Ed. 2)

The safety specifications are also met under the following environmental conditions in addition to or in excess of those stated in the operating conditions:	
Altitude	up to 2000 m
Temperature	+5°C – +40°C
Mains supply fluctuations	± 10% from nominal
Installation category (overvoltage category)	II according to IEC 60664-1 (see Note 1)
Pollution degree	2 according to IEC 60664-1 (see Note 2)

Note 1: The *installation category* (overvoltage category) defines the level of transient overvoltage, which the instrument is designed to withstand safely. It depends on the nature of the electricity supply and its means of overvoltage protection. For example, in CAT II, which is the category used for instruments in installations supplied from a supply comparable to public mains, such as hospital and research laboratories and most industrial laboratories, the expected transient overvoltage is 2500 V for a 230 V supply and 1500 V for a 120 V supply.

Note 2: The *pollution degree* describes the amount of conductive pollution present in the operating environment. Pollution degree 2 assumes that normally only nonconductive pollution, such as dust, occurs with the exception of occasional conductivity caused by condensation.

Both of these affect the dimensioning of the electrical insulation within the instrument.

9.5 In conformity with the requirements

iEMS Incubator/Shaker HT bears the following markings:
Type 1415
100 – 120 Vac, 200 – 240 Vac 50/60 Hz, 230 VA max.
CE mark

iEMS Incubator/Shaker HT conforms to the following requirements:
2006/95/EC (Low Voltage Directive)
2004/108/EC (Electromagnetic Compatibility Directive, EMC)
FCC Part 15, Subpart B/Class B
2002/96/EC (Waste of Electrical and Electronic Equipment)
2006/66/EC (Directive on batteries and accumulators and waste batteries and accumulators)

Safety performance:
EN 61010-1:1993 + A2:1995/IEC 61010-1:1990 + A1:1992 + A2:1995 including CENELEC Common Modifications, US and CA National differences
EN 61010-2-010:1994 + A1:1996 including CENELEC Common Modifications, US and CA National differences
EN 61010-1:2001 (Ed. 2)

EMC performance:	
EN 50081-1:1992	Generic emission standard. Residential, commercial and light industry.
EN 50082-1:1997	Generic immunity standard. Residential, commercial and light industry.
EN 61326-1:1997 + A1:1998 + A2:2001 + A3:2003	Product family standard.

Test standards	**Performance limits**
EN 55022:1998	Class B, 150 kHz – 1 GHz
EN 61000-3-2:1995 + A1:1998 + A2:1998 + A13:1997 + A14:2000	Class A
EN 61000-3-3:1995	
ANSI C63.4:1992	Class B, 450 kHz – 1 GHz
EN 61000-4-2:1995 + A1:1998	4 kV CD, 8 kV AD, Criteria B
EN 61000-4-3:1996 + A1:1998	3 V/m, 80 MHz – 2 GHz, Criteria A
EN 61000-4-4:1995	1 kV, Criteria B
EN 61000-4-5:1995	2 kV line to ground, 1 kV line to line, Criteria B
EN 61000-4-6:1996	3 V_{rms}, 150 kHz – 80 MHz, Criteria A
EN 61000-4-8:1994	3 A/m, Criteria A
EN 61000-4-11:1994	30%/10 ms, Criteria B 60%/100 ms, Criteria C 100%/20 ms, Criteria B > 95%/5 s, Criteria C

10 Ordering Information

Contact your local Thermo Fisher Scientific representative for ordering and service information.

Code	Instrument
5112250	iEMS Incubator/Shaker HT with three (3) thermal microplate holders HT, 220 – 240 V
5112257	iEMS Incubator/Shaker HT with three (3) thermal microplate holders HT, 100 – 120 V
5921210	iEMS thermal microplate holder HT

10.1 List of accessories and recommended spare parts

Code	Item
1506400A	*iEMS Incubator/Shaker HT User Manual*
1610400	Dust cover for iEMS Incubator/Shaker (1 module)
5180190	RS/Device link cable
1210940	Fuse 3 A slow
1210550	Power cord, Euro (230 V)
1210520	Power cord, USA (100 V and 115 V)
5921210	iEMS thermal microplate holder HT

11 Warranty Certificate

Thermo Fisher Scientific Microplate Instrumentation Business products are fully guaranteed against defective parts and materials, including defects caused by poor workmanship, for a period of twelve (12) months from the date of delivery.

Thermo Fisher Scientific will repair or replace defective parts or materials during the term of warranty at no extra charge for materials and labor provided that the products were used and maintained in accordance with Thermo Fisher Scientific's instructions. The warranty is invalid if products have been misused or abused.

For this warranty to be effective, the product must have been purchased either directly from Thermo Fisher Scientific or from an authorized Thermo Fisher Scientific distributor. The guarantee is not transferable to a third party without prior written approval from Thermo Fisher Scientific.

This guarantee is subject to the following exclusions:

- Any defects caused by normal wear and tear.
- Defects caused by fire, lightning, flood, earthquake, explosion, sabotage, war, riot or any other occurrence of the character listed above.
- Refurbished products that are subject to different warranty conditions.

THIS WARRANTY IS IN LIEU OF ALL OTHER EXPRESSED OR IMPLIED WARRANTIES, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. The seller is not liable for any loss or damage arising out of or in connection with the use of the product or other indirect damages.

Full warranty terms and conditions can be obtained from your local Thermo Fisher Scientific dealer.

11.1 Warranty limitations

- Consumables are not included in the warranty.

12 Index

A

Accessories 48
  inspecting 15
  unpacking 14
Aerosols 40
Application 56
Audio signal 23
  turning off 28

C

Catalog numbers 2
Certificate of Decontamination 55
Check list 14
Checking parameters 33
Clock time 18
Complaint order 43
Consumables
  warranty limitations 49
Contact information 57
Control LEDs 10, 23, 39

D

Decontamination 36, 38
  Certificate of 55
  instrument surface 37
  procedure 36
  thermal microplate holder 37
Dimensions 44
Directives 47
Disinfectants 36
Display 12
Disposal
  instrument 38
  materials 36

E

Environmental conditions 44
Evaporation 40, 45

F

Feedback Form 56
Fuse block assembly 16
Fuses 35, 44

H

Heating 31
Heating time 21
Holder 13

I

Incubation temperature 20
Incubation time 21
Incubation time tracking 40
Incubator slot preheating 26, 39
Inserting the microplate 24

Installation 14
category 46
check list 14
setups 16
site 15
Instrument 9
advantages 9
cleaning 34
decontamination 36
disposal of 38
inspecting 15
markings 47
packing for service 38
unpacking 14
Intended use 9
Interval time 21

K

Keyboard 12
cleaning 34
Keyboard keys 12

L

LC display 12

M

Mains supply cable 17
Mains switch 17
Maintenance 34
Microplate
disposal of 36, 42
placing of 24
Microplate holder 13

O

Operating conditions 15
Operation
normal 27, 28
preheating and heating 31
principle 9, 19
programming protocols 20
shaking 32
Ordering information 48

P

Packing
disposal of materials 38
for service 38
list 15
Parameters
incubation temperature 20
incubation time 21
interval time 21
same for all slots 20
setting 20
shaking time 21
viewing 33
Pausing shaking 33

Placing the microplate into thermal microplate holder 24
Plate 9
Power cable 17
Preheating 26, 31
Programming 20
Protocols 20

Q

Quick Reference Guide 54

R

Reset 30, 42

S

Service 34, 43
  packing for 38
  request protocol 43
Setting parameters 20
Setup 18
Shaking 32
  pausing 33
  speed 26, 39, 41
  time 21
Site of operation 15
Slot status 23
Slot temperature 41
Slot warmup time 41
Specifications 44
  general 44
  incubator 45
  safety 46
  shaker 45
Speed settings 22
Spills 34, 40
Splashing 22, 32, 40

T

Temperature setting 26, 41
Thermal microplate holder 13
  cleaning 34
  placing of 24
Transport damage 15
Transport package 14, 15

U

Unpacking 14

V

Viewing parameters 33, 40
Voltage selector 16

W

Warranty 14, 49
Weight 15, 44
Working area 15

13 Glossary and Abbreviations

EIA	Enzyme immunoassay.
EN	European Norm.
EU	European Union.
IEC	International Electrotechnical Commission.
Incubator	An apparatus for maintaining optimal conditions (temperature, humidity, etc.) for growth and development.
Microplate	A rigid or framed polystyrene plate with microwells in different well formats (for example, 6, 12, 24, 48, 96, 384, 864, etc. wells) for ease of use in performing multiple tests through techniques such as EIA or ELISA.
Orbital shaking	The shaking of a microplate in a circular movement with a fixed orbit and adjustable speed.
rpm	Revolutions per minute.

13.1 Keywords for web pages

drug discovery
EIA
ELISA
enzyme immunoassay
immunoassay
incubating
incubator
incubator shaker
liquid handling
microplate
microplate incubator
Microtiter plate
microwell plate
orbital shaker
orbital shaking
orbital shaking incubator
plate
separation technique(s)
shaker
shaking
solid phase assay(s)
Thermo Fisher Scientific
Thermo Scientific

Appendix A: Thermo Scientific iEMS Incubator / Shaker HT Quick Reference Guide

1. Place the microplate into the thermal microplate holder so that well A1 is located in the upper left corner when viewed with the numbers on the holder's handle the right side up. Refer to Fig. 6.2.
2. Insert the thermal microplate holder into an incubation slot. Refer to Fig. 6.3 and Fig. 6.4.
3. Switch the instrument ON. Refer to Fig. 4.1, item 7.
4. Program the incubation and shaking parameters for the appropriate slot:

   Press the slot number (**1** – **3**) and ↵ (Enter). For all slots, press **0** ↵.

   Enter the incubation and shaking parameters in the following order (refer to Section 6.2), and confirm each selection by pressing ↵:

   - Temperature (°C)
   - Incubation time (hh:mm:ss)
   - Shaking time (hh:mm:ss)
   - Interval time (hh:mm:ss)
   - Shaking speed as shown below:

Value	0	1	2	3	4	5
Shake speed (rpm)	0	400	650	900	1150	1400

5. Press **temp** followed by the slot number to start the preheating of the thermal microplate holder. Refer to Section 6.5.
6. Wait until the control LED changes from a flashing orange to a continuous orange.
7. Press the slot number (**1** – **3**) and then **start** to start the protocol. The protocol will start and the LED will light up with a red color.
8. When the protocol is completed, the LED will light up with a green color and you will hear a beeping sound. The heating stays on.
9. To turn off the heating, press the slot number and then **stop**.
10. Remove the thermal microplate holder from the slot when the module is not shaking.



Warning: The thermal microplate holder will be hot after use. Only move the microplate holder from its handle. Use protective gloves when opening the cover and removing the microplate.



Caution: Do not place the microplate holder in or remove it from the instrument while the instrument is shaking. This may damage the shaking mechanism.

11. Turn the instrument OFF.

Appendix B: Certificate of Decontamination

The decontamination procedure is required prior to shipping the instrument to Thermo Fisher Scientific Oy, for example, for repair. If, for any reason, the instrument is shipped back to Thermo Fisher Scientific Oy, it must be accompanied by a dated and signed Certificate of Decontamination, which must be attached to the outside of the package containing the instrument. See Section 7.4 Decontamination procedure.

Failure to confirm decontamination will incur additional labor charges or at worst the items will be returned for proper cleaning.

Before returning any instrument(s) or item(s), ensure they are fully decontaminated. Confirm A or B status:

Name: _____

Address: _____

Tel./Fax: _____

Name: _____ Serial no.: _____

A)
I confirm that the returned items have not been contaminated by body fluids, toxic, carcinogenic or radioactive materials or any other hazardous materials.

B)
I confirm that the returned items have been decontaminated and can be handled without exposing the personnel to health hazards.

Materials used in the unit: Chemicals + Biological • Radioactive *)

Specific information about contaminants: _____

_____

_____

Decontamination procedure[1]: _____

_____

_____

Date and place: _____

Signature: _____

Name (block capitals): _____

*) The signature of a Radiation Safety Officer is also required when the unit has been used with radioactive materials.

This unit is certified by the undersigned to be free of radioactive contamination.

Date and place: _____

Signature: _____

Name (block capitals): _____

PHOTOCOPIABLE

[1] Please include decontaminating solution used.

Please send to Thermo Fisher Scientific Oy
Fax: +358-9-32910415

Appendix C: Thermo Scientific iEMS Incubator / Shaker HT Feedback Form

Cat. no.	Serial no.
PURCHASED BY	**PURCHASED FROM**
Company/Organization	Distributor
Department	
Address	Address
Tel.	Tel.
Fax	Date of delivery
Internet home page	
Date of purchase	
Your research area	
Dr. ☐ Mr. ☐ Mrs. ☐ Ms. ☐ Job title/Position	
Surname (block capitals)	First name (block capitals)
Internet e-mail address	

	Excellent	Above expectations	As expected	Below expectations	Comments
Reagent kit/Instructions	☐	☐	☐	☐	
Instrument/User manual	☐	☐	☐	☐	
Operational reliability	☐	☐	☐	☐	
Design	☐	☐	☐	☐	
Ease of use	☐	☐	☐	☐	
Operational costs	☐	☐	☐	☐	
Customer support	☐	☐	☐	☐	

Further instrument/system developments desired:

Further applications desired:

Where did you first learn about the product?

Would you like to receive information about other Thermo Scientific products?

Appendix D: Addresses

For the latest information on products and services, visit our websites at:

http://www.thermo.com

Manufactured by:

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P.O. Box 100, FI-01621 Vantaa, Finland
Tel. +358-9-329 100, Fax +358-9-3291 0415
www.thermo.com

Distributed by:

Notes



Notes



Notes



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Finland

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