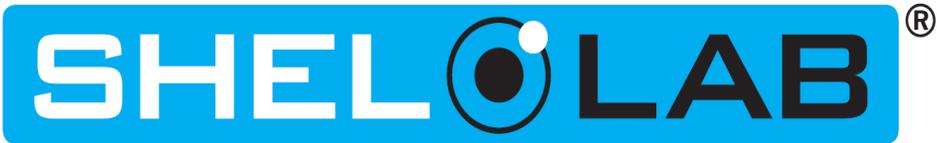


SMI INCUBATORS



100 – 120 Voltage

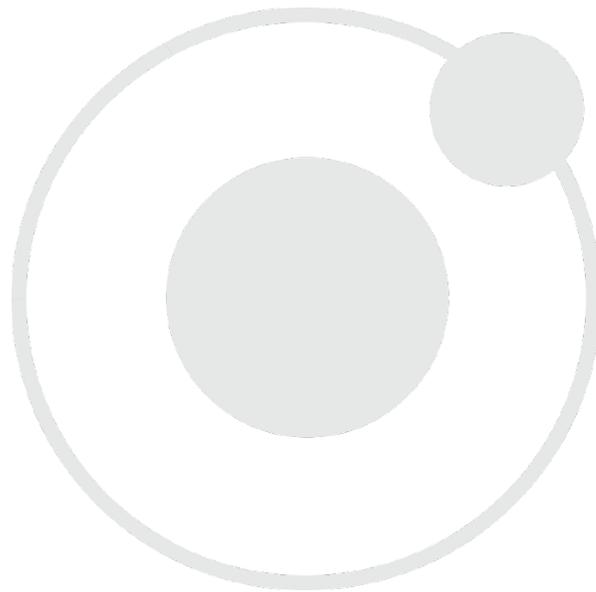


Installation - Operation Manual

SMI2 SMI6 SMI7 SMI11 SMI12

Pictured on the front cover, left to right: SMI2, SMI6, SMI7, SMI11, SMI12

Note: The SMI12 requires two power outlets.



SMI Microbiological Incubators

100 – 120 Voltage

Part Number (Manual): 4861825

Revised: December 12, 2018

Sheldon Part ID Numbers:

Model	SMI2	SMI6	SMI7	SMI11	SMI12
Part ID	SLM222	SLM622	SLM722	SLM1122	SLM1222

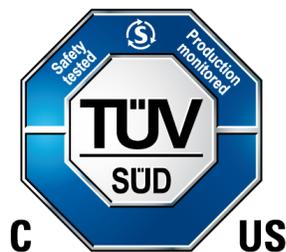
The Part ID denotes the specific build type of the model.



SHEL LAB is a brand of Sheldon Manufacturing, INC, an ISO 9001 certified manufacturer.



Safety Certifications



These units are CUE listed by TÜV SÜD as incubators for professional, industrial, or educational use where the preparation or testing of materials is done at an ambient air pressure range of 22.14 – 31.3 inHg (75 – 106 kPa) and no flammable, volatile, or combustible materials are being heated.

These units have been tested to the following requirements:

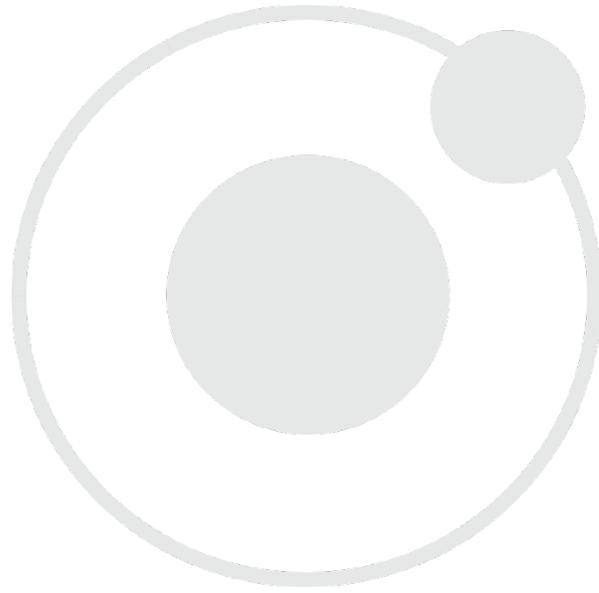
- CAN/CSA C22.2 No. 61010-1:2012
- CAN/CSA C22.2 No. 61010-2-010 + R:2009
- UL 61010A-2-010:2002
- UL 61010-1:2012
- EN 61010-1:2010
- EN 61010-2-010:2003

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INTRODUCTION

Thank you for purchasing a SHEL LAB incubator. We know you have many choices in today's competitive marketplace when it comes to constant temperature equipment. We appreciate you choosing ours. We stand behind our products and will be here if you need us.

READ THIS MANUAL

Failure to follow the guidelines and instructions in this user manual may create a protection impairment by disabling or interfering with the unit safety features. This can result in injury or death.

Before using the unit, read the manual in its entirety to understand how to install, operate, and maintain the unit in a safe manner. Ensure all operators are given appropriate training before the unit begins service.

Keep this manual available for use by all operators.

SAFETY CONSIDERATIONS AND REQUIREMENTS

Follow basic safety precautions, including all national laws, regulations, and local ordinances in your area regarding the use of this unit. If you have any questions about local requirements, please contact the appropriate agencies.

SOPs

Because of the range of potential applications this unit can be used for, the operator or their supervisors must draw up a site-specific standard operating procedure (SOP) covering each application and associated safety guidelines. This SOP must be written and available to all operators in a language they understand.

Intended Applications and Locations

The incubators are intended for constant temperature, non-humidified microbiological incubation applications in professional, industrial, and educational environments. The units are not intended for use at hazardous or household locations.

Power

Your unit and its recommended accessories are designed and tested to meet strict safety requirements.

- The unit is designed to connect to a power source using the specific power cord type shipped with the unit.
- Always plug the unit power cord into a protective earth grounded electrical outlet conforming to national and local electrical codes. If the unit is not grounded properly, parts such as knobs and controls can conduct electricity and cause serious injury.
- Do not bend the power cord excessively, step on it, or place heavy objects on it.
- A damaged cord can be a shock or fire hazard. Never use a power cord if it is damaged or altered in any way.
- Use only approved accessories. Do not modify system components. Any alterations or modifications to your unit not explicitly authorized by the manufacturer can be dangerous and will void your warranty.

INTRODUCTION

CONTACTING ASSISTANCE

Phone hours for Sheldon Technical Support are 6 am – 4:30 pm Pacific Coast Time (west coast of the United States, UTC -8), Monday – Friday. Please have the following information ready when calling or emailing Technical Support: the **model number, serial number, part number, and part ID** (see page 18).

support@sheldonmfg.com
1-800-322-4897 extension 4
(503) 640-3000 extension 4
FAX: (503) 640-1366

Sheldon Manufacturing, INC.
P.O. Box 627
Cornelius, OR 97113
USA

MANUFACTURING WARRANTY

For information on your warranty and online warranty registration please visit:

sheldonmanufacturing.com/warranty

ENGINEERING IMPROVEMENTS

Sheldon Manufacturing continually improves all of its products. As a result, engineering changes and improvements are made from time to time. Therefore, some changes, modifications, and improvements may not be covered in this manual. If your unit's operating characteristics or appearance differs from those described in this manual, please contact your SHEL LAB dealer or customer service representative for assistance.

INTRODUCTION

REFERENCE SENSOR DEVICE

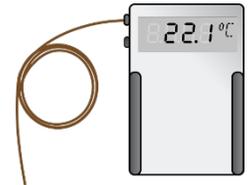
Must be purchased separately

A reference sensor device is required for calibrating the unit temperature display.

Reference devices must meet the following standards:

- Accurate to at least 0.1°C

The device should be regularly calibrated, preferably by a third party.



Temperature Reference

Temperature Probe

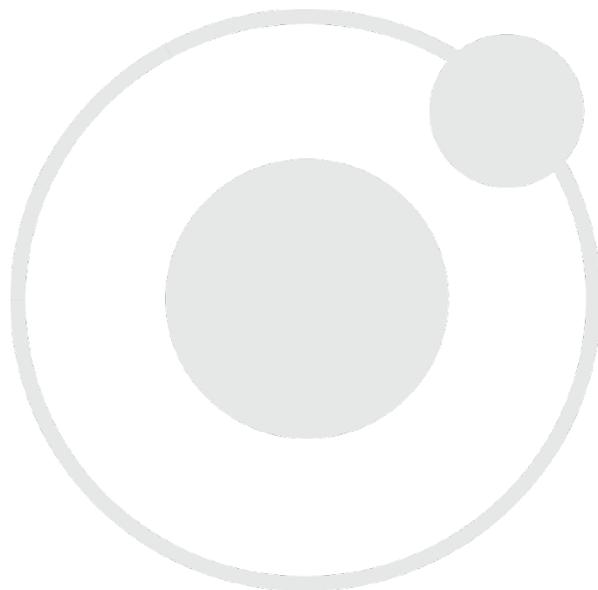
Use a digital device with a wire thermocouple probe that can be introduced into the unit chamber through the access port or door space. Select a thermocouple suitable for the application temperature you will be calibrating at.

Why a Probe?

Reference readings taken from outside the chamber using wire temperature probes avoid chamber door openings. Openings disrupt the chamber temperature. Each disruption requires **a minimum 1-hour wait** to allow the chamber to re-stabilize before continuing.

No Alcohol or Mercury Thermometers

Alcohol thermometers do not have sufficient accuracy to conduct accurate temperature calibrations. **Never place a mercury thermometer in the unit chamber.** Always use thermocouple probes.



RECEIVING YOUR UNIT

INSPECT THE SHIPMENT

- When a unit leaves the factory, safe delivery becomes the responsibility of the carrier.
- **Damage sustained during transit is not covered by the manufacturing defect warranty.**
- Save the shipping carton until you are certain that the unit and its accessories function properly.

When you receive your unit, inspect it for concealed loss or damage to its interior and exterior. If you find any damage to the unit, **follow the carrier's procedure for claiming damage or loss.**

1. Carefully inspect the shipping carton for damage.
2. Report any damage to the carrier service that delivered the unit.
3. If the carton is not damaged, open the carton and remove the contents.
4. Inspect the unit for signs of damage. Use the orientation images in this chapter as references.
5. The unit should come with an Installation and Operation Manual.
6. Verify that the correct number of accessory items has been included.
7. Carefully check all packaging for accessory items before discarding.

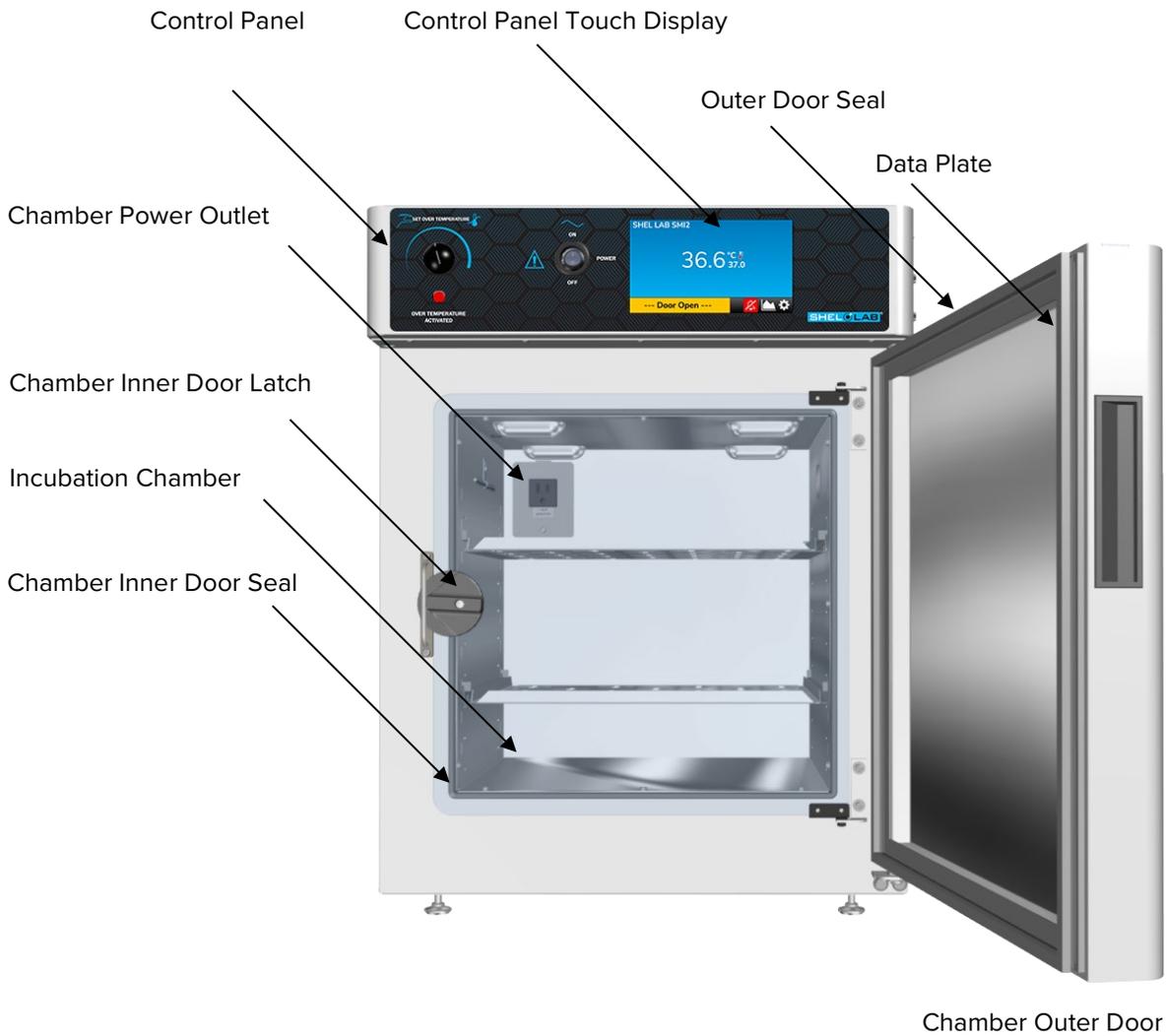
Included Accessories

Model	Shelves	Shelf Mounts	Leveling Feet	Power Cord
SMI2, SMI7	2	4	4	1
SMI6	3	6	4	1
SMI11	6	12	4	1
SMI12	6	12	4	2



ORIENTATION IMAGES

SMI2 Front

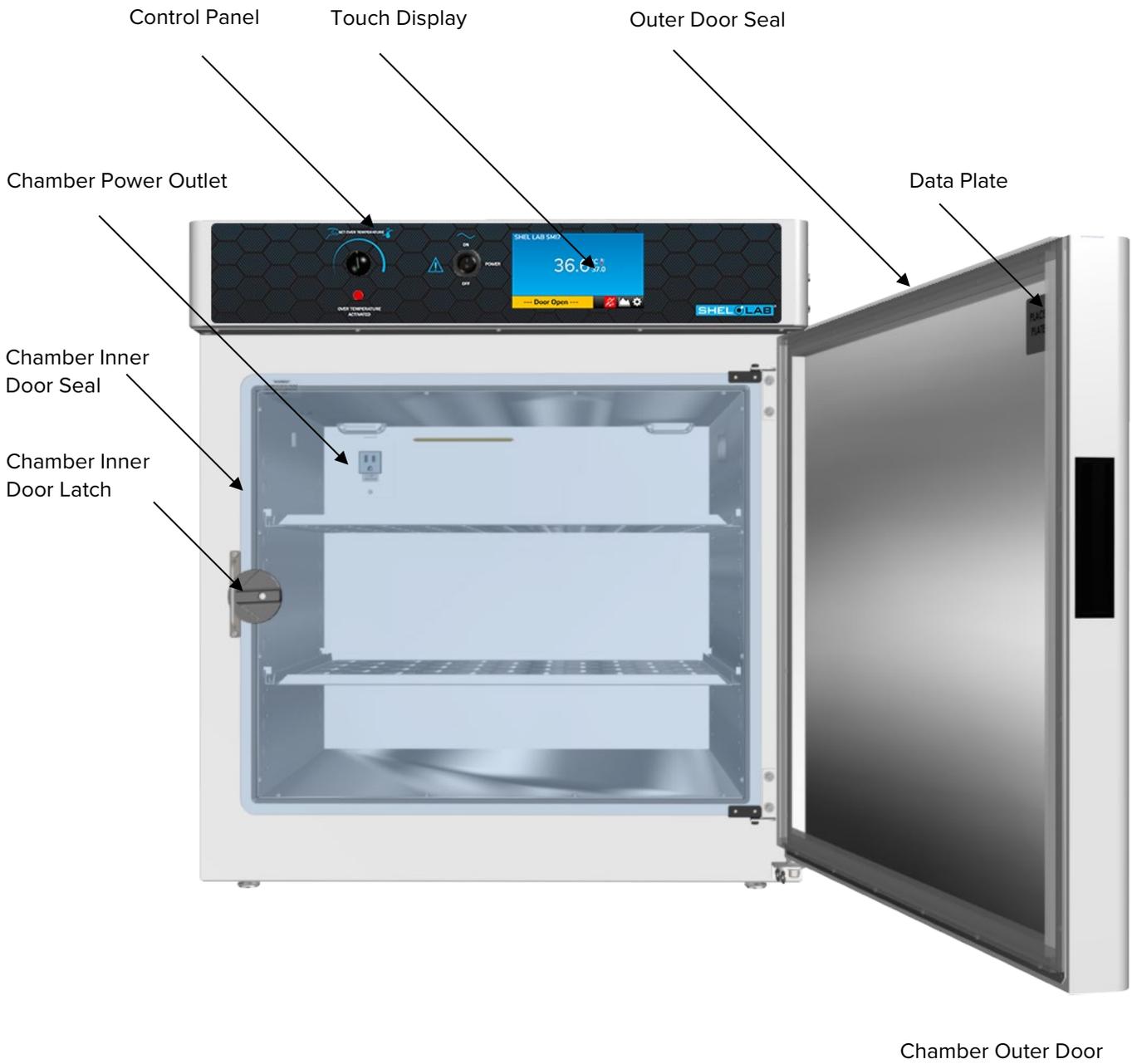


SMI6 Front

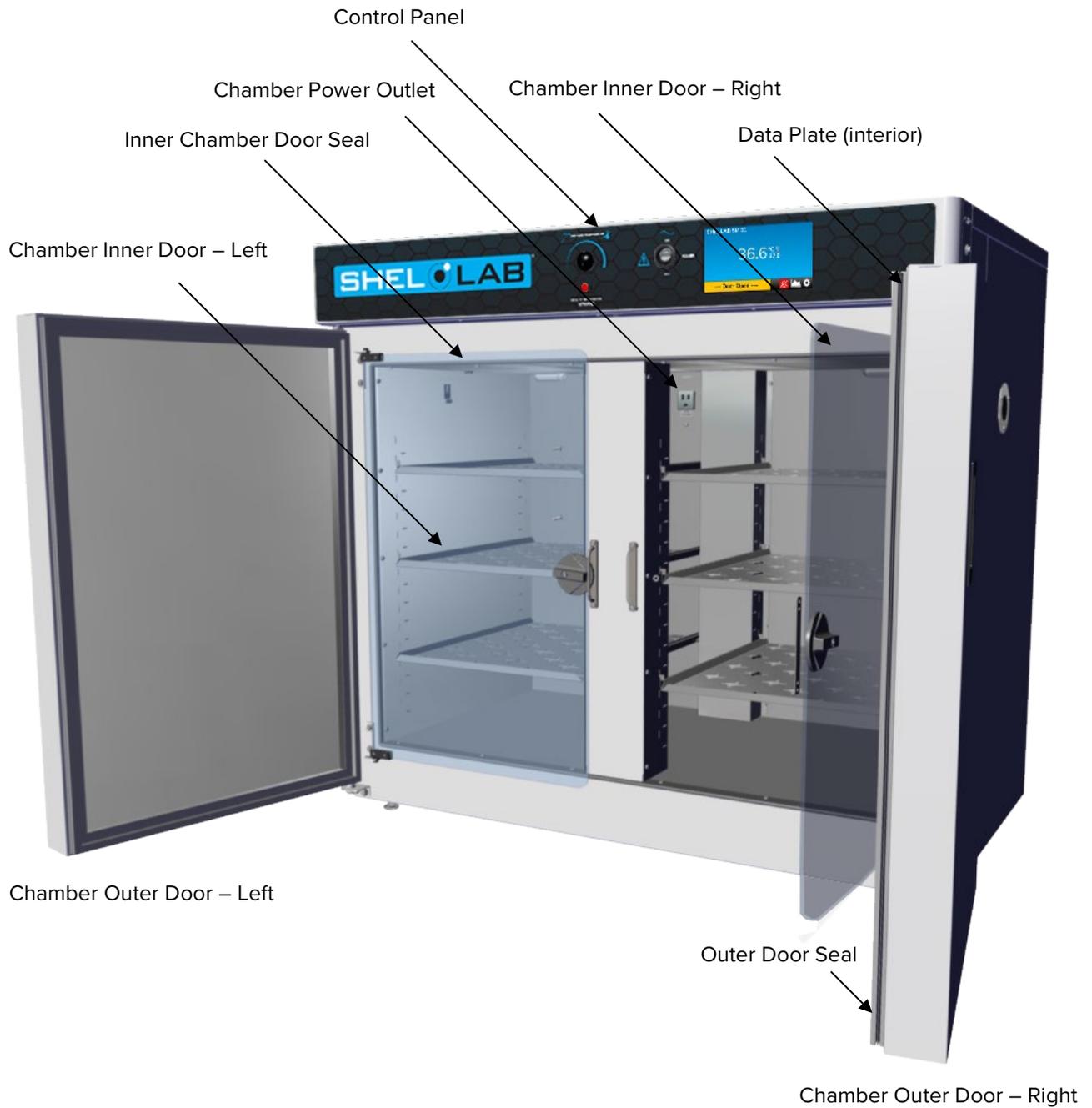


RECEIVING

SMI7 Front



SMI11 Front



Note: The SMI11 has a single incubation chamber.

RECEIVING

SMI12 Front



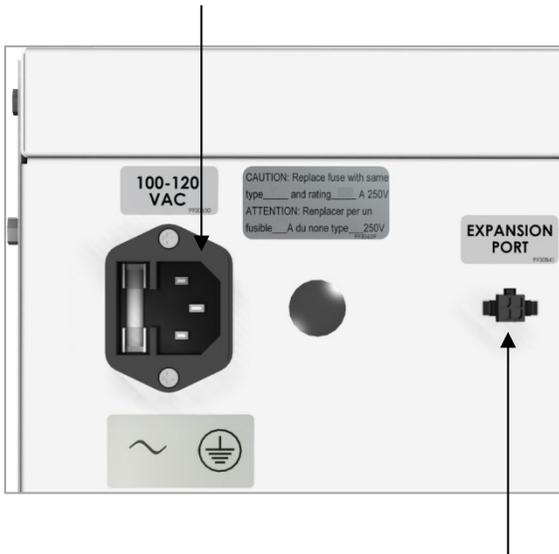
Note: The SMI12 consists of two SMI6 incubators secured to a stacking brace. Each incubator operates independently and is separately powered.

RECEIVING

Sides – All Incubator Models

Left Side

Power Cord Inlet with Fuse Holder
(Fuse Holder Cover Removed)



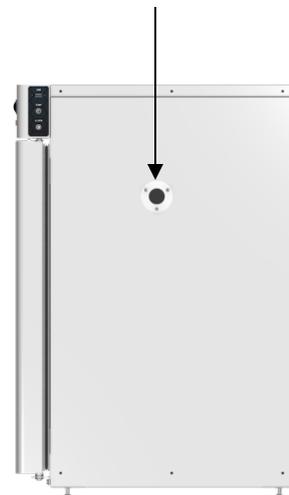
24-volt Expansion Port for SHEL LAB Accessories

Right Side

Data Ports



Chamber Access Port



RECORDING DATA PLATE INFORMATION

Record the unit **model number**, **serial number**, **part number**, and **part ID** below for future reference. Tech Support needs this information to provide accurate help during support calls and emails.

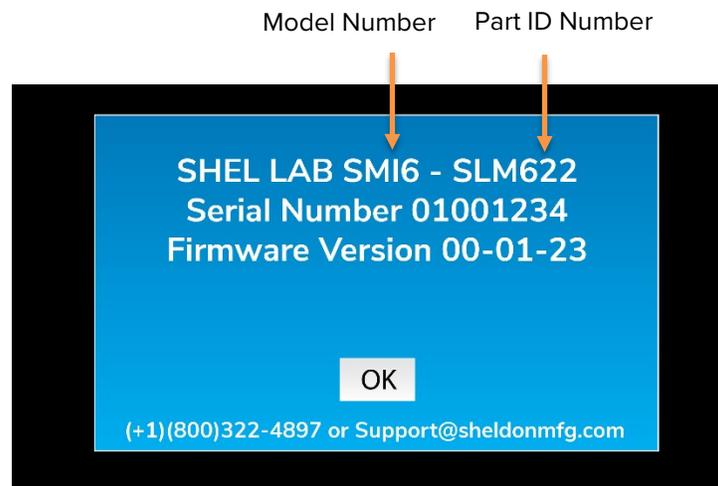
- **SMI2, SMI6, SMI7**
 - The data plate is located on the inside of the incubation chamber door in the top right corner.

- **SMI11**
 - The data plate is located on the inside of the right-hand chamber door in the top right corner.

- **SMI12**
 - The data plate is located on the exterior, left-side of the incubator, on or just above the mounting brace.

MODEL NO:	
SERIAL NO:	
PART NO:	
PART ID:	

- The Model Number, Part ID, and Serial Number can also be found on the About screen in the settings menu.



INSTALLATION PROCEDURES CHECKLIST

For installing the unit in a new workspace location.

Pre-Installation

- ✓ Check that the required ambient conditions for the unit are met, page 20.
- ✓ Check that the spacing clearance requirements are met, page 20.
 - Unit dimensions may be found on page 53.
- ✓ Check that a suitable electrical outlet and power supply is present, page 21.

Install the incubator in a suitable workspace location

- ✓ Review the lifting and handling instructions, page 22.
- ✓ Remove the unit from the pallet, page 22.
- ✓ Install the unit leveling feet, page 22.
- ✓ Install the incubator in its workspace location, page 22.

Set up the incubator for use

- ✓ Clean and disinfect the unit and shelving (recommended), page 23.
- ✓ Install the shelving, page 24.
- ✓ Verify the port cover is installed on the access port, page 24.

INSTALLATION

REQUIRED AMBIENT CONDITIONS

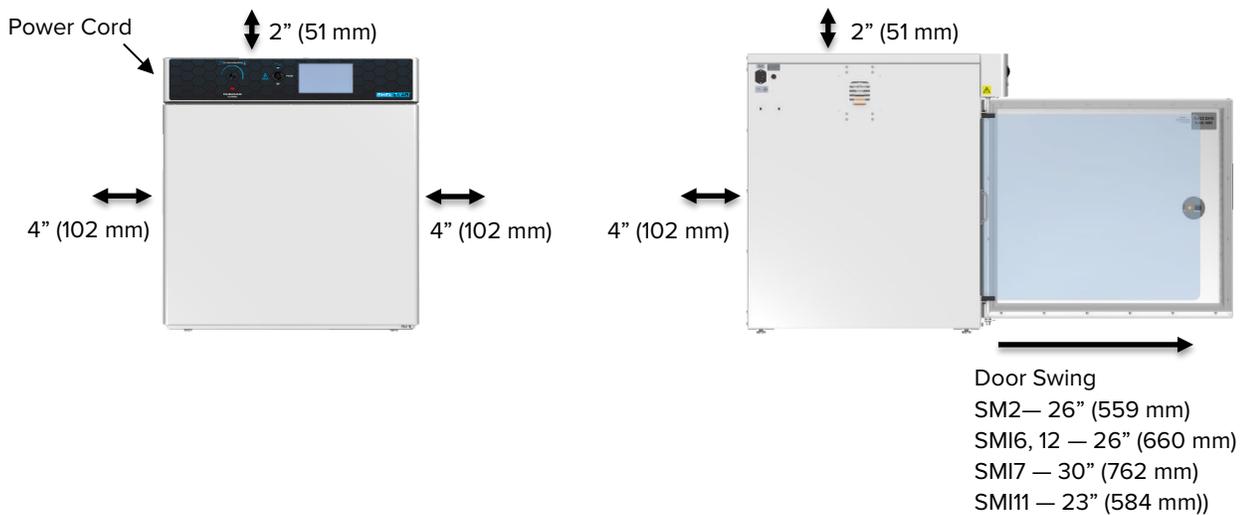
These units are built for use indoors at room temperatures between **15°C and 30°C (59°F and 86°F)**, at no greater than **80% Relative Humidity** (at 25°C / 77°F). Operating outside these conditions may adversely affect the unit temperature performance.

When selecting a location to install the unit, consider all environmental conditions that can adversely impact its temperature performance. These include:

- Proximity to ovens, autoclaves, or any other device producing significant radiant heat
- Heating and cooling vents or other sources of fast-moving air currents
- High-traffic areas
- Direct sunlight

REQUIRED CLEARANCES

These clearances are required to provide air flows for ventilation and cooling.



4 inches (102 mm) of clearance is required on the sides and back.

2 inches (51 mm) of headspace clearance is required between the top of the unit and any overhead partitions.

INSTALLATION

POWER SOURCE REQUIREMENTS

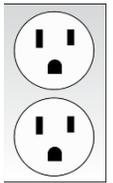
When selecting a location for the unit, verify each of the following requirements is satisfied.

Power Source: The power source must match the voltage and amperage requirements listed on the unit data plate. These units are intended for **100 – 120 volt, 50/60 Hz** applications at the following amperages:

Model	Amperage	Model	Amperage
SMI2	4.5 Amps	SMI7	6.5 Amps
SMI6	6.0 Amps	SMI11	10.0 Amps
SMI12	6.0 Amps*		

*The SMI12 comes with two power cords. It requires **6.0 amps** for each cord.

- The wall power source must be protective earth grounded.
- **The unit may be damaged if the supplied voltage varies by more than 10% from the data plate rating.**
- Use a separate circuit to prevent loss of the unit due to overloading or circuit failure.
- **The recommended wall circuit breakers for these units are 15 amps.**
- The wall power source must conform to all national and local electrical codes.



Standard
NEMA 5-15R
wall socket

Power Cord: The unit must be positioned so that all end-users can quickly unplug the cord in the event of an emergency.

- Each unit is provided with a **125-volt, 15 amp, 9ft 5 in (2.86m) NEMA 5-15P** power cord. Always use this cord or an identical replacement.



Fuses: Each unit ships with a fuse installed in the power cord inlet.

- The fuse must be installed and intact for the unit to operate.
- Always find and fix the cause of a blown fuse prior to putting the unit back into operation.
- Fuse types:
 - SMI7, SMI11: 250V T10 amp, 5x20mm
 - SMI2, SMI6, SMI12: 250V T6.3 amp, 5x20mm



INSTALLATION

LIFTING AND HANDLING

The unit is heavy. Use appropriate lifting devices that are sufficiently rated for these loads. Follow these guidelines when lifting the unit.

- Lift the unit only from its bottom surface.
- Doors, handles, and knobs are not adequate for lifting or stabilization.
- Restrain the unit completely while lifting or transporting so it cannot tip.
- Remove all moving parts, such as shelves and trays, and lock doors in the closed position during transfers to prevent shifting and damage.

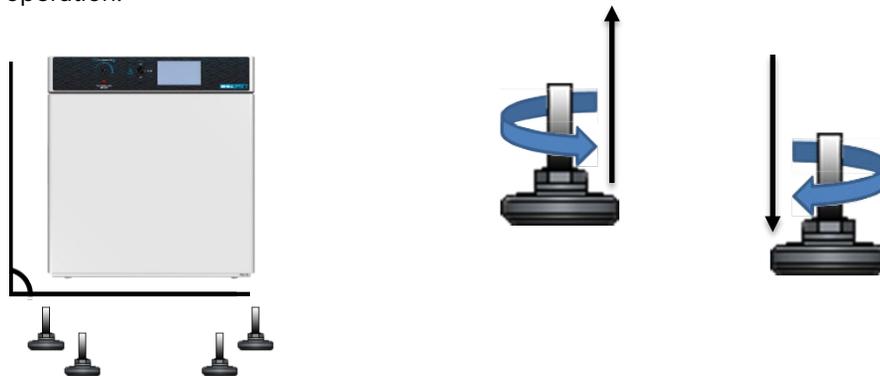
REMOVING FROM THE PALLET

The unit comes secured to a shipping pallet with ½” hex bolts inserted through the 4 leveling feet holes on the bottom of the incubator. Use a socket wrench to remove the bolts and release the unit from the pallet.



LEVELING

Install the 4 leveling feet in the 4 corner holes on the bottom of the unit. The unit must be level and stable for safe operation.



Note: To prevent damage when moving the unit, turn all 4 leveling feet so that the leg of each foot sits inside the unit.

INSTALL THE INCUBATOR

Install the unit in a workspace location that meets the criteria discussed in the previous entries of the Installation chapter.

DEIONIZED AND DISTILLED WATER

Do not use deionized water to clean the unit, even if DI water is readily available in your laboratory.

- Use of deionized water may corrode metal surfaces and **voids the manufacturing warranty**.
- The manufacturer recommends the use of distilled water in the resistance range of 50K Ohm/cm to 1M Ohm/cm, or a conductivity range of 20.0 uS/cm to 1.0 uS/cm, for cleaning applications.

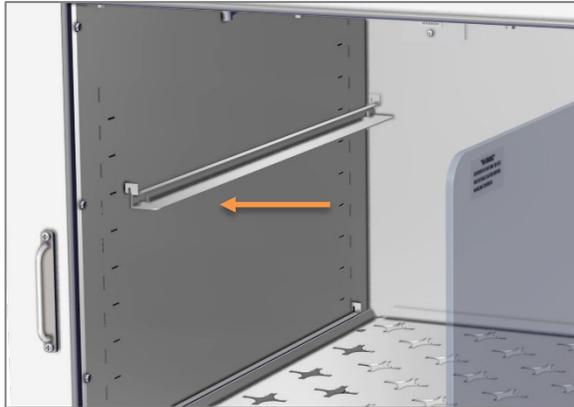
INSTALLATION CLEANING AND DISINFECTION

The manufacturer recommends cleaning the shelving and chamber prior to installation of the shelving in the chamber.

- The unit was cleaned at the factory but may have been exposed to contaminants during shipping.
- Remove all wrappings and coverings from shelving prior to cleaning and installation. **Do not clean the shelving with deionized water.**
- Please see the [Cleaning and Disinfection](#) procedure on page 45 in the User Maintenance chapter for information on how to clean and disinfect without damaging the unit.

INSTALLATION

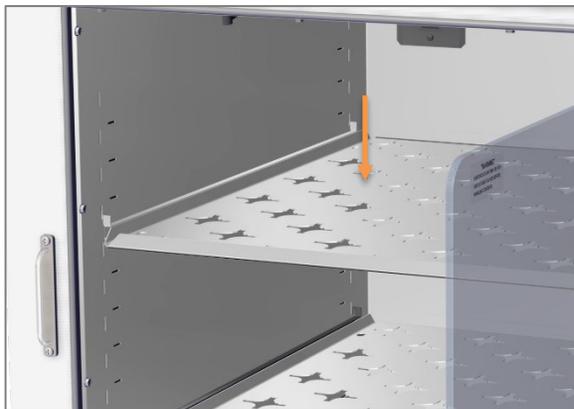
INSTALL THE SHELVING



1. Install 2 shelf mounting rails.



2. Verify both mounts are level with one another and securely seated.



3. Place 1 shelf on the installed rails.



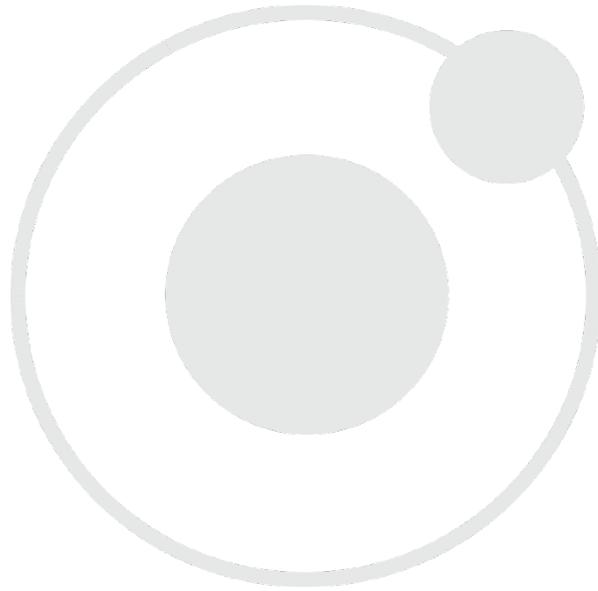
ACCESS PORT

Always leave access port cap in place, except when introducing sensor probes into the chamber. Removing the cap during normal operations can adversely impact temperature stability and uniformity.

GRAPHIC SYMBOLS

The unit is provided with graphic symbols on its exterior. These identify hazards and adjustable components as well as important notes in the user manual.

Symbol	Definition
	Consult the user manual Consulter le manuel d'utilisation
	Temperature display Indique l'affichage de la température
	Over Temperature Limit system Thermostat température limite contrôle haute
	AC Power Repère le courant alternatif
	I/ON O/OFF I indique que l'interrupteur est en position marche. O indique que le commutateur est en position d'arrêt.
	Protective earth ground Terre électrique
	Manually adjustable Indique un réglage manuel
	Recycle the unit. Do not dispose of in a landfill. Recycler l'unité. Ne jetez pas dans une décharge.



CONTROL OVERVIEW



Over Temperature Limit (OTL)

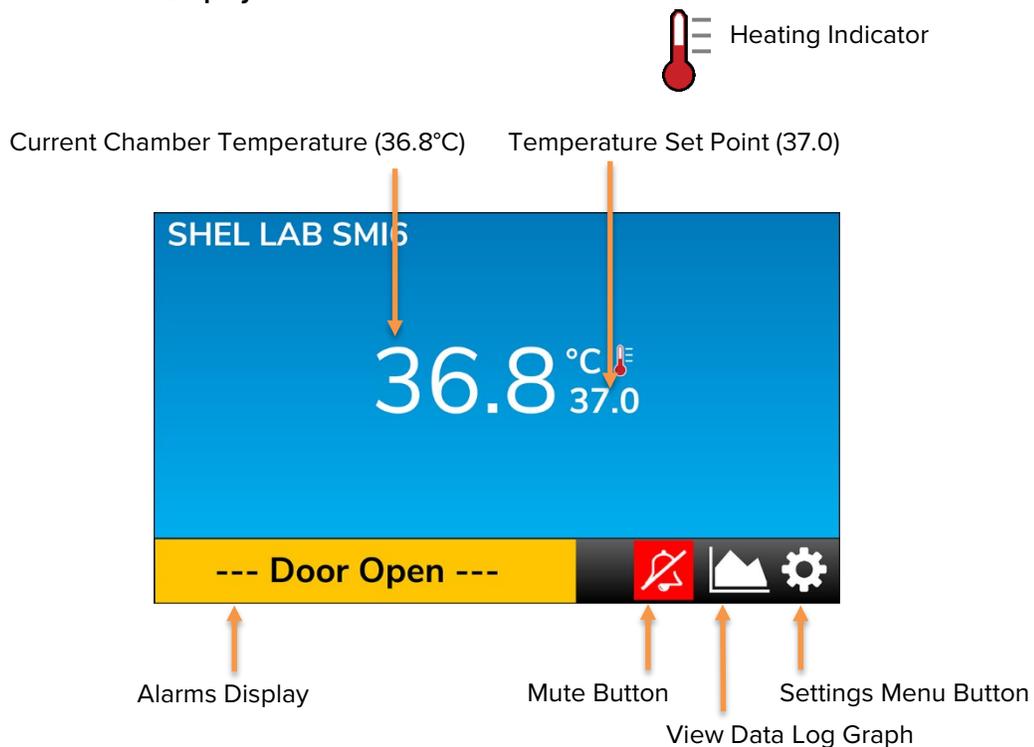
This graduated dial sets the mechanical heating cut off for the Over Temperature Limit system (OTL). The OTL helps prevent unchecked heating of the chamber in the event of an electronics failure or external heat spike. For details, please see the [Over Temperature Limit System](#) description in the Theory of Operations (page 29).

The red Over Temperature Activated light illuminates when the OTL system cuts off heating to the unit chamber by rerouting power away from the heating elements.

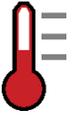
Power Switch

Power is supplied when the switch is in the (I) ON position.

Temperature Control and Display



CONTROL



Heating Indicator

The icon is invisible when the incubator is not heating. It fades in and out while the incubator is calling for power to the chamber heating elements.

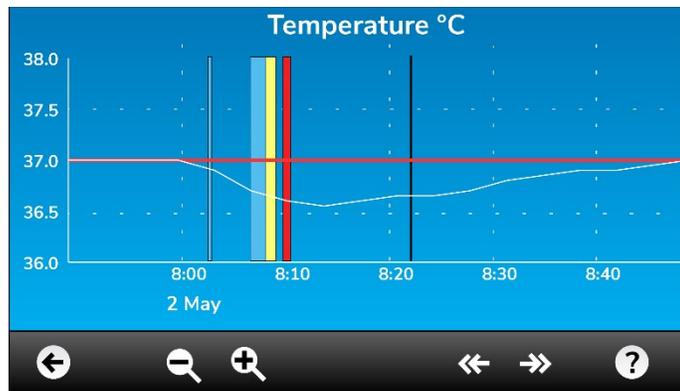


Mute Button

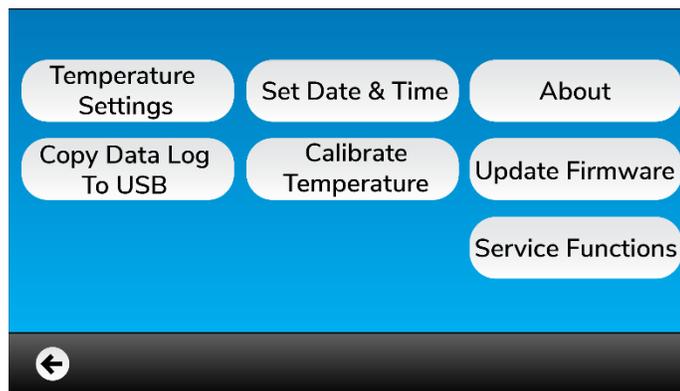
Only visible when an alarm is active. When an active alarm is muted, the red background disappears.



Data Log Graph



Settings Menu



OPERATION

THEORY OF OPERATION

Note: Each incubator chamber in an SMI12 is independently powered and heated.

Heating

When powered, the incubator heats to and maintains a user-selected target set point in the incubation chamber. The incubator senses the chamber air temperature using a solid-state probe mounted on the chamber interior wall. When the incubator detects that the chamber temperature has dropped below the target set point, it pulses power to the heating elements inside the chamber walls and in the outer chamber door.

The incubator uses Proportional – Integral – Derivative (PID) control to avoid significantly overshooting the set point. This means the rate of heating slows as the chamber temperature approaches the target temperature. If the chamber temperature is above the set point, the incubator uses minimum heating to control the rate of cooling and avoid dipping below the set point.

Additionally, the PID loops optimize heating rates for the temperature environment around the incubator. If the incubator is operating in a cool room, it will increase the length of heating pulses to compensate. Likewise, when operating in a warm room the incubator uses shorter pulses. If the ambient temperature conditions change significantly, there may be minor over or undershoots as the incubator adapts.

SMI incubators rely on natural heat radiation for cooling. These units can achieve a low-end temperature just above the ambient room temperature plus the internal waste heat of the unit.

Each outer chamber door is self-heating to bolster the thermal uniformity and stability of the chamber and to minimize condensation on the glass viewing door. The inner glass door will cool while the chamber door is opened, eventually leading to condensate on the door and impacting the chamber temperature stability and uniformity. Minimize sample viewing times when possible.

The Over Temperature Limit System (OTL)

The OTL is a user-set, mechanical heating cutoff connected to a hydrostatic sensor probe inside the incubation chamber. The system operates independently of the main microprocessor temperature controller and routes power away from the incubator heating elements if the chamber temperature exceeds the OTL temperature cutoff setting. It will continue doing so as long as the chamber temperature remains above the OTL setting. This helps safeguard the unit by preventing runaway heating in the event of electronics failures or a sudden external heat spike.

The OTL must be set by the user in order to function. The manufacturer recommends a setting of approximately 1°C above the highest temperature set point of your heating application. A red indicator illuminates when the OTL is rerouting power.

Data Logging and Outputs

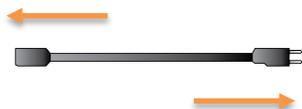
The incubator logs up to 5 years of temperature and event data with measurements recorded every 60 seconds. The log can be exported as a spreadsheet-readable .CSV file using the USB port on the right side of the incubator. A 4 – 20 milliamp data port outputs temperature data as an analog signal suitable for building monitoring systems. An open / closed dry contact port communicates alarm activation instances.



PUT THE INCUBATOR INTO OPERATION

Perform the following steps and procedures to put the unit into operation after installing it in a new workspace environment.

1. Plug in the power cord.



Attach the power cord that came with the unit to the inlet receptacle on the left side of the incubator.

Plug the power cord into the workspace electrical outlet.

2. Turn on the incubator.



Place the incubator Power Switch in the ON (I) position.

3. Set the Date and Time.

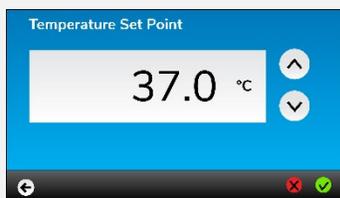


See the [Set Date and Time](#) procedure on **page 32**.

4. Set the Temperature settings.



OTL set to Max



See the [Temperature Settings](#) procedure on **page 33**. The procedure includes:

- Setting the temperature set point.
- Setting the temperature deviation alarm parameters.

Continued on next page

OPERATION

Continued from the previous page.

5. Allow the incubator to heat soak for a minimum 8 Hours.



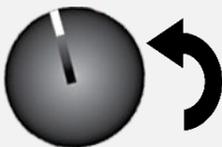
Wait 8 Hours

Run the unit for at least 8 hours (for example, overnight) with chamber doors closed prior to:

- Setting the Over Temperature Limit (next step).
- Loading samples.

This helps ensure a stable temperature environment.

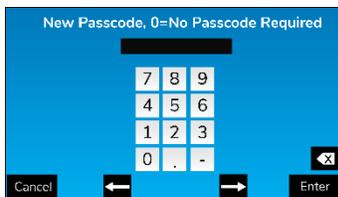
6. Set the Over Temperature Limit.



Set the Over Temperature Limit. See **page 35**.

- The incubator must be heated and stable at your application temperature to perform this procedure.

Optional: Passcode lock the incubator settings.



The **Passcode Lock** procedure sets a numeric passcode that locks the incubator settings and major functions, see **page 36**.

- The incubator ships from the factory unlocked.

The incubator is now ready for use.

- You may **Load Samples**, see page 39.

End of procedure

OPERATION



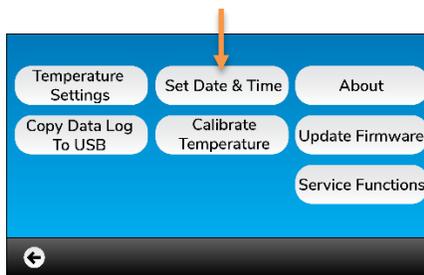
SET THE DATE AND TIME

The incubator date and time are used for logging temperature, event, and diagnostic information.

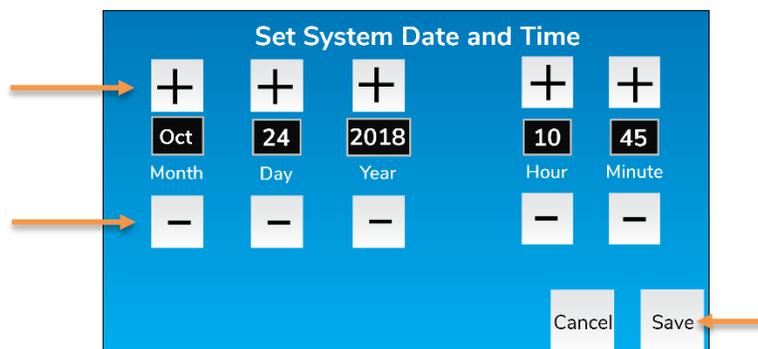
1. On the homepage, tap the **Settings** button.



2. Tap the **Set Date and Time** button.



3. Adjust the incubator date and time to your local date and time.



4. Tap the **Save** button to save your date and time and return to the **Settings** menu.

- Tapping **Cancel** returns to the **Settings** menu without saving any changes.

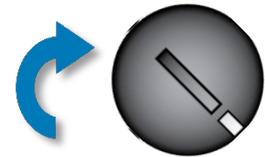
TEMPERATURE SETTINGS

Adjust the temperature set point and temperature deviation alarm settings. The incubator comes from the factory set to 37°C.



Note: Each SMI12 incubator chamber must be set independently.

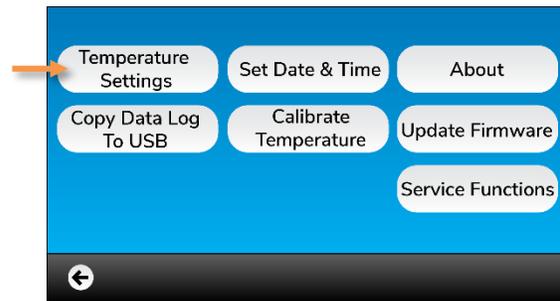
Turn the OTL dial clockwise to its maximum setting, if not already set at max. This prevents the heating cutoff system from interfering with this procedure.



1. Open the Temperature Settings menu.



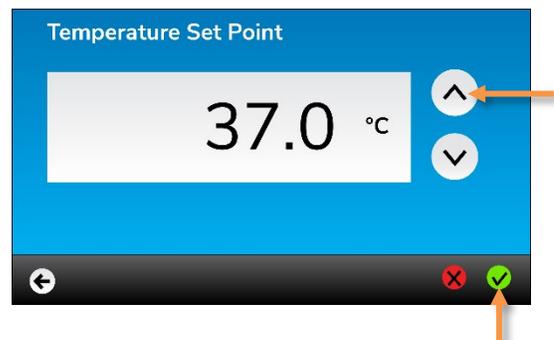
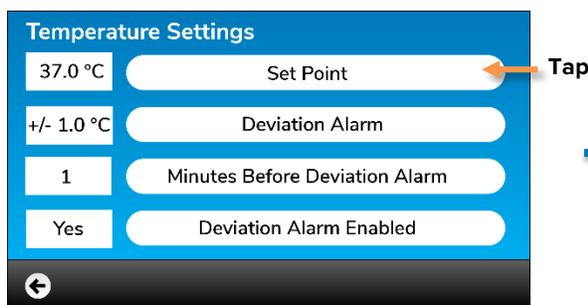
Tap the Settings icon.



Tap the Temperature Settings button.

2. Adjust the temperature set point (optional).

If your study uses a temperature other than 37°C, use the arrow buttons to adjust the set point. Tap the green checkmark button to save the new set point and advance to the next step.



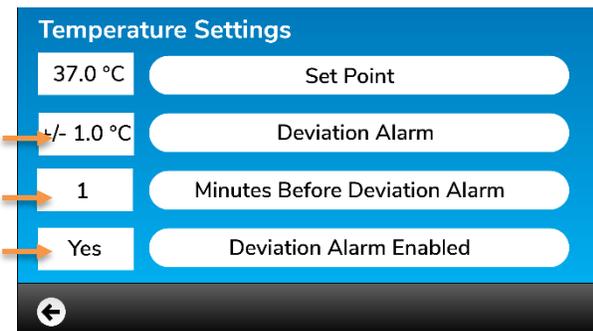
Tap to save the setting and exit.

Continued next page

OPERATION



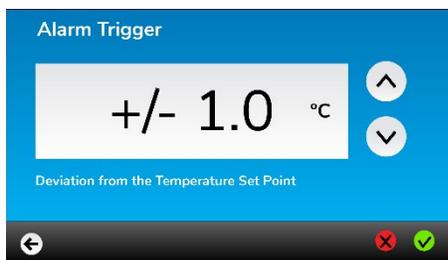
3. Adjust the temperature deviation alarm settings (optional).



The incubator comes set to alarm if the chamber temperature deviates from the set point by 1°C or more for 1 minute or longer.

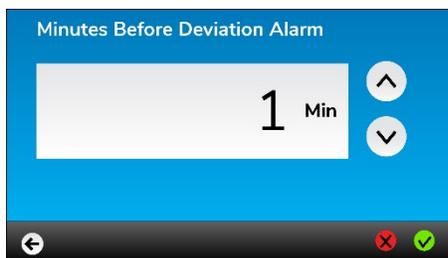
Conditions: The deviation alarm is only active when the outer chamber door is closed. The alarm remains off for 6 minutes after the door is closed following an opening. See page 38 for other alarm conditions.

Settings

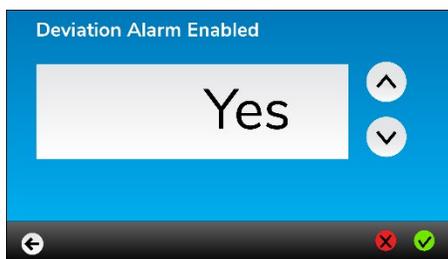


Alarm Trigger: This sets a \pm range of deviation from the current temperature set point that will not trigger an alarm. The range can be set from $\pm 0.2^{\circ}\text{C}$ to $\pm 3^{\circ}\text{C}$.

- This helps prevent the incubator from alarming during small or short-lived deviations.
- The incubator comes set to $\pm 1^{\circ}\text{C}$.



Minutes Before Deviation Alarm: The default setting of 1 means that the chamber temperature must deviate for more than 1 minute before the alarm activates.



Deviation Alarm Enabled: This setting turns the deviation alarm on or off.

- **Note:** This setting does not affect the mechanical Over Temperature Limit system.



Reminder: Tapping the green checkmark saves the new setting and advances to the next page.

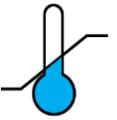
End of procedure

OPERATION

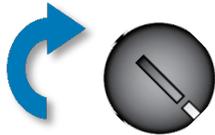
Note: Test the OTL system at least once per year to verify its functionality. **Failure to set the OTL voids the manufacturing defect warranty if over temperature damage occurs.**

SET THE OVER TEMPERATURE LIMIT (OTL)

This procedure sets the mechanical heating cutoff to approximately 1°C above the current chamber temperature. **Perform this procedure when the unit has been running with no temperature fluctuations at your application temperature for at least 8 Hours.**



1. Set OTL control to its maximum setting, if not already set to max.

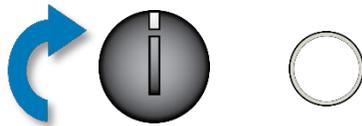


2. Turn the dial counterclockwise until the Over Temperature Activated light illuminates.



- There is a soft click when the OTL begins rerouting power away from the heating elements.

3. Slowly turn the dial clockwise until the Over Temperature light turns off.



- The Over Temperature Limit is now set approximately 1°C above the current chamber air temperature.

4. Leave the OTL dial set just above the activation point.



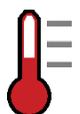
Optional: Turn the dial slightly to the left (counterclockwise).



- This sets the cutoff threshold nearer to the current chamber temperature.

If the Over Temperature Limit sporadically activates after setting the control, turn the dial very slightly to the right (clockwise). If the OTL continues activating, check for ambient sources of heat or cold that may be adversely impacting the unit temperature stability. If you find no sources of external or internal temperature fluctuations, contact Tech Support or your distributor for assistance.

Note: When the OTL is active and routing power away from the heating elements, the temperature icon on the unit display will remain visible if the unit controller continues calling for power to the elements.



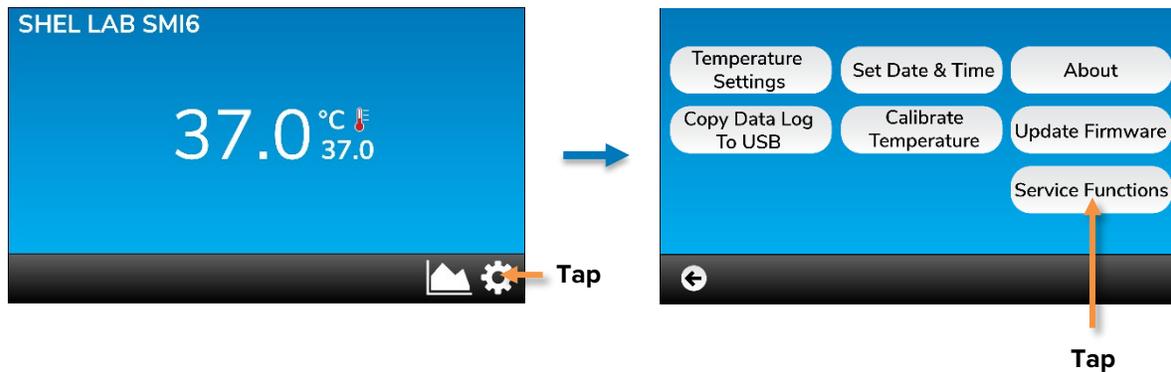
OPERATION



PASSCODE LOCKING THE INCUBATOR

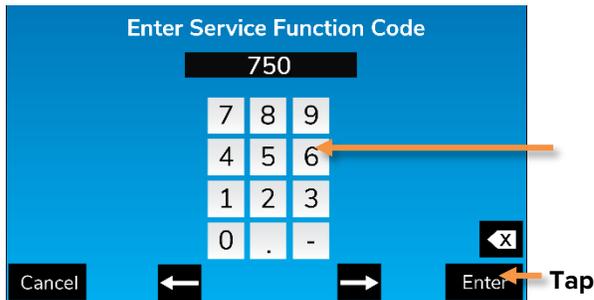
This procedure locks the incubator temperature set point and other settings with a numeric code of your choosing. Users will be prompted to enter the code when attempting to change the settings of a locked unit.

1. **Open the Service Functions menu.**

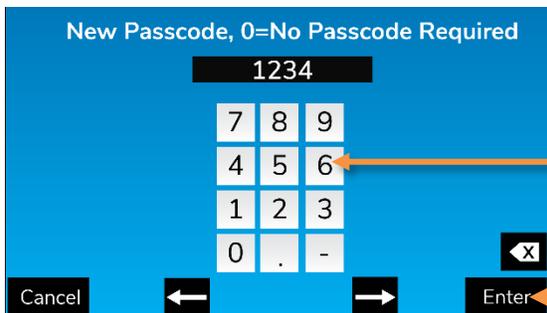


2. **Enter 750 in the Service Function Code field.**

This brings up the Passcode menu.



3. **Enter a 1 to 4-digit numeric passcode of your choosing.**



Note: A value of 0 leaves the incubator unlocked.

Note: 1234 is not a secure passcode.

Tap to save the passcode and return to Settings menu.

Note: The settings will not lock until the display is returned to the homepage.

Note: The display will automatically return to the homepage after 120 seconds of inactivity.

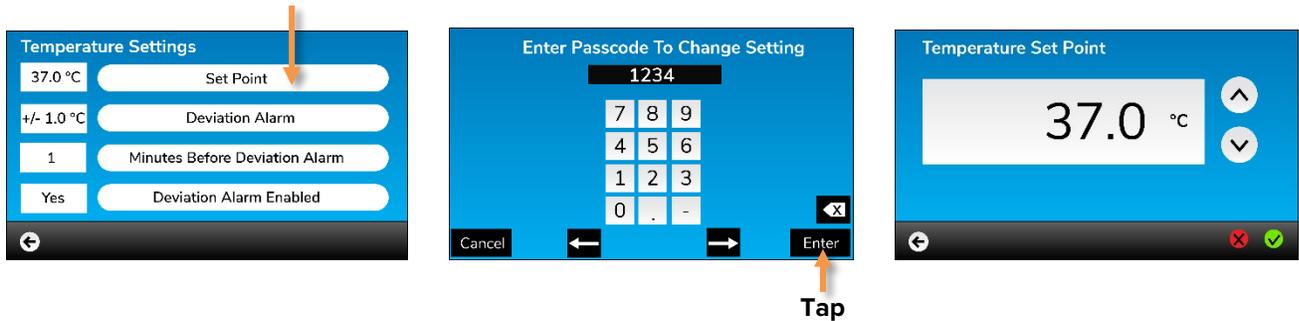
OPERATION

Passcode Locking, Continued

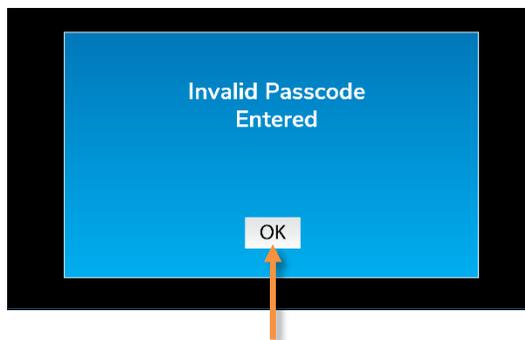


Changing Settings When Passcode Locked

Users will be prompted to enter the passcode when attempting to change any settings. After entering the code, the settings remain unlocked until the display is returned to the homepage.



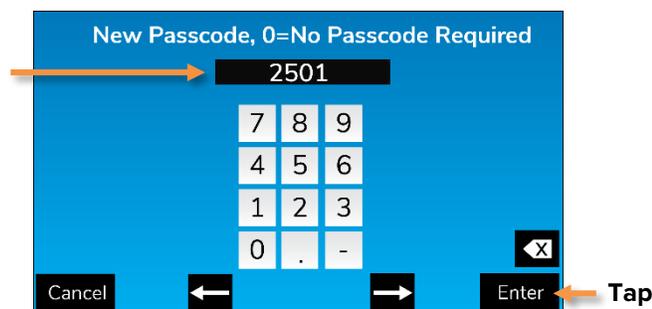
Tap OK to return to the previous screen if an invalid passcode has been entered. There is no limit to the number of times a passcode can be attempted.



Tap **OK** to return to the Settings menu.

Changing the Passcode

Access the Passcode menu and enter a new passcode value. Enter a value of 0 to disable the Passcode Locking function.



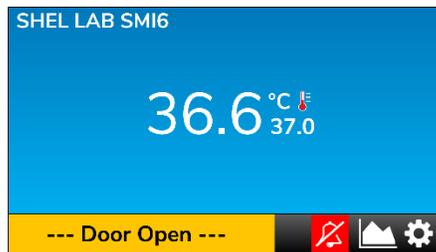
Note: If the passcode has been lost, please contact [Technical Support](#) for assistance.



ACTIVE ALARMS AND MUTING

The incubator comes with two types of digital alarms: Door and deviation.

Door Alarms



Deviation Alarms



Note: The deviation alarm timer only begins counting down after the conditions to the right have ended.

Door Open Notification

- Door open 0 – 60 seconds
- Visual notification only

Door Open Warning

- Door open 61 – 120 seconds
- Visual notification and audible chime

Door Open Alarm

- Door open 120+ seconds
- Visual and audible alert

Temperature Deviation Alarms

- Visual and audible alert

The deviation alarms **will not activate** under the following conditions:

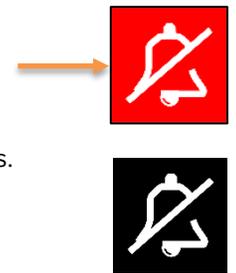
- If the door is currently open.
- For 6 minutes after the door was last closed.
- For 15 minutes after the temperature set point is changed.
- For 45 minutes after the unit is turned on or until the temperature is within the +/- Temperature Deviation setting.

Muting the Audible Alert

Tapping the mute icon mutes the currently active alarm.

- The audible alert remains silent until the alarm deactivates or until another alarm activates.

The mute icon disappears when the alarm deactivates.



Alarm Muted

Deactivating an Alarm

Alarms deactivate when the unit returns to normal operating conditions.

- **Door Alarm:** Deactivates when the door is closed.
- **Deviation Alarms:** Deactivate when the incubation chamber temperature returns to within the temperature deviation alarm bounds set by the user.

LOADING SAMPLES

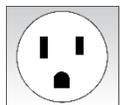
The manufacturer strongly recommends waiting at least **8 hours** after putting the unit into operation before loading samples in the incubation chamber. This allows the unit to heat soak, protecting against temperature instability.

- Samples should be placed at least 1 inch (25 mm) away from the chamber walls.
- Proper spacing allows for maximum air circulation and a higher degree of temperature uniformity.
- Proper spacing also decreases the chance of condensate forming in the incubator when operating with a large number of samples in the chamber.

CHAMBER ACCESSORY POWER OUTLET

The incubator is provided with a 100 – 120-volt, 1 amp power outlet inside the chamber. Do not attach powered equipment that draws more than 1 amp.

- Verify that any powered accessory equipment used inside the chamber can safely and effectively operate within your selected temperature range.
- Powered equipment, such as stirrers or shakers, can generate heat sufficient to disrupt the thermal uniformity and stability of the chamber.



OPERATION

POWER AND MEMORY

The incubator stores the data log, temperature set point, and other settings in non-volatile memory. The unit retains log data and its settings indefinitely in the event of a power outage.



DATA LOG

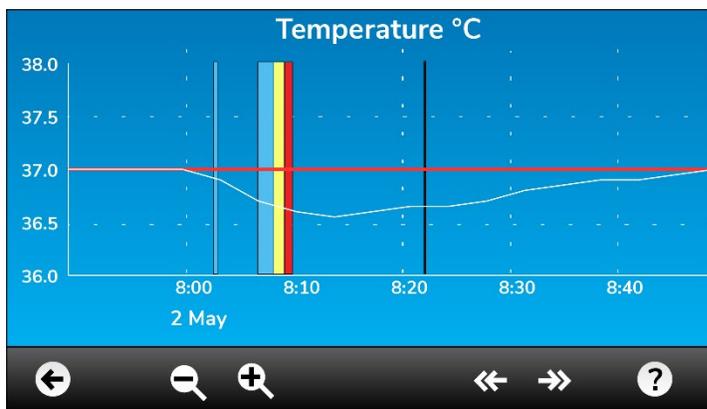
The incubator logs the chamber temperature and set point once per minute. It also logs events.

- Alarm activations are logged the moment the alarm is activated.
- Power outages are retroactively logged as starting at the moment of outage.

The incubator stores up to 5 years of continually logged data.



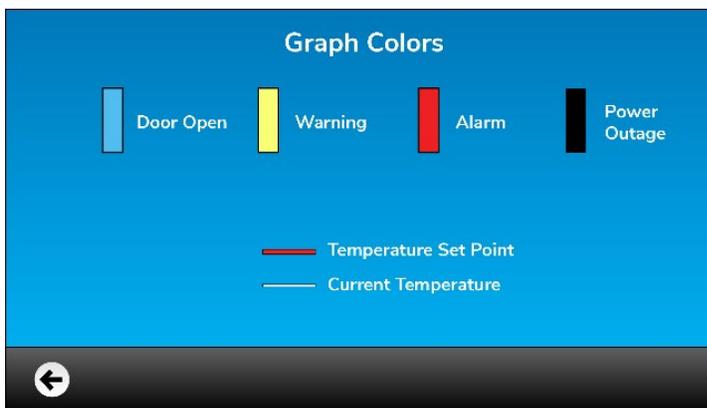
Logged data can be viewed as a graph on the incubator by touching the graph icon.



- Tapping the graph on a vertical guideline centers the graph on that point in time.
- The graph can be zoomed in or out.



The (?) Help button brings up a color legend for the graph.



- Power Outage includes periods during which the unit is off.

OPERATION

COPYING THE DATA LOG

The incubator exports user-specified date ranges from the log as human-readable .CSV spreadsheet files. **Note:** This does not erase any log data on the incubator.

1. Insert a USB A thumb drive in the incubator USB Port.

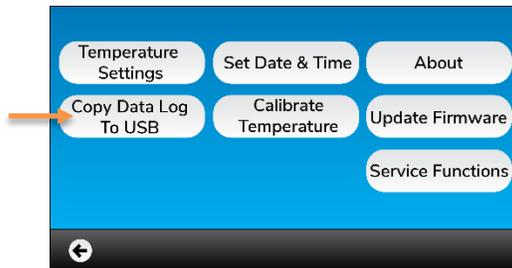
- **Note:** The Copy page cannot be accessed unless a thumb drive is in the port.



Thumb Drive



2. In the Settings menu, tap the Copy Data Log to USB button.

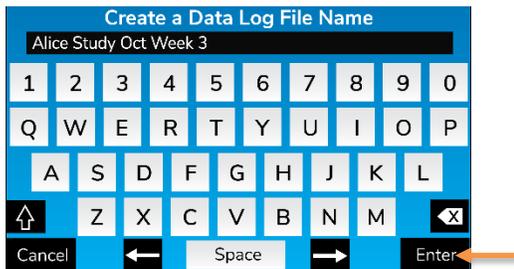


USB Formatting

For best results:

- Use a FAT32 formatted drive
- It may take up to 30 seconds for the incubator to recognize some formats or USB brands.

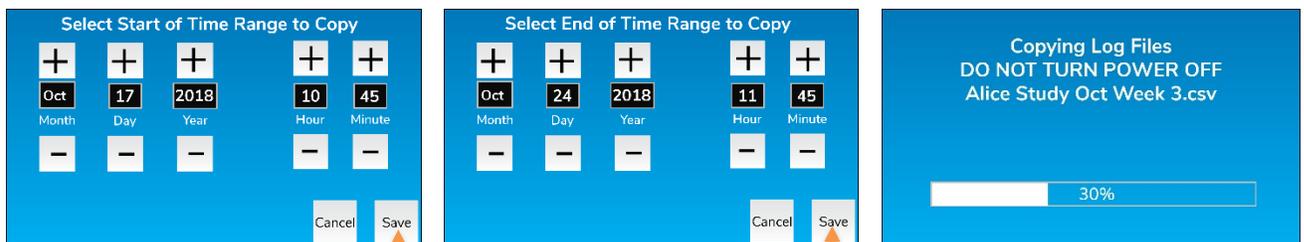
3. Create a file name and tap Enter.



Note: Entering the file name of a data log file already on the USB drive appends the new date range to the existing spreadsheet rather than overwriting the original file or any data in it.

4. Select a Date/Time range, “Start” and “End”. This is the data that will be copied.

- Saving the End value starts the download.



Note: The time range must be at least 5 minutes in length and the End value must be prior to the current date and time.

REAL TIME DATA OUTPUTS



TEMP Port: 4 – 20mA analog output describing the current chamber temperature.

Parameter	Parameter Value at 4mA	Parameter Value at 20mA
Temperature	0°C	70°C

This port connects to an audio jack (male mono phono plug, ¼ inch (6.3 mm)). Jacks and cables are **not** included with the incubator.

Data Monitoring Systems – Max Resistance

For building management and other data monitoring or logging systems, the maximum resistance of the current loop from the 4-20mA module is 250 Ohms. At higher loop resistances, the current value will be erroneously low for parameter values near the top of the scale.

Alarm Port: A dry contact port.

This port communicates all alarm activations as On or Off outputs in which Open position indicates an alarm instance. The port connects to an audio jack and cable (male mono phono plug, ¼ inch (6.3 mm)).

Jacks and cables are **not** included with the incubator.

Note: The USB port does not output data in real time.

ACCESSORY EXPANSION PORT



This 24-volt port powers and supports SHEL LAB accessories. **Only plug in devices specifically authorized for this port.**

HUMIDIFYING THE INCUBATOR

Long-term use of a large water container, such as a humidifier pan, will create excess water vapor in the unit and can damage the electrical components of an SMI incubator. Additionally, use of **deionized water** may cause significant corrosion damage to the incubator. Overloading the unit with sample media may also damage the incubator from excessive media evaporation and disruption of air flow pathways through the shelf space.

Small Sample Load

Placing a small number of petri dishes or other media containers in the incubator chamber may lead to excessively fast drying of sample media. A **small** water-filled container, such as an open flask, may be placed in the chamber to help slow sample drying with small loads.

CONDENSATION AND THE DEW POINT



Relative humidity inside the incubation chamber should never be allowed to exceed 80% at 25°C. Exceeding this threshold will likely result in condensation and possibly leaks around the incubator and may cause corrosion damage if allowed to continue for any significant length of time.

Condensation takes place whenever the humidity level in the incubation chamber reaches the dew point. The dew point is the level of humidity at which the air cannot hold more water vapor. The warmer the air, the more water vapor it can hold.

As the level of humidity rises in an incubation chamber, condensate will first appear on surfaces that are cooler than the air temperature. Near the dew point, condensate forms on any item or exposed surface even slightly cooler than the air. When the dew point is reached, condensate forms on nearly all exposed surfaces.

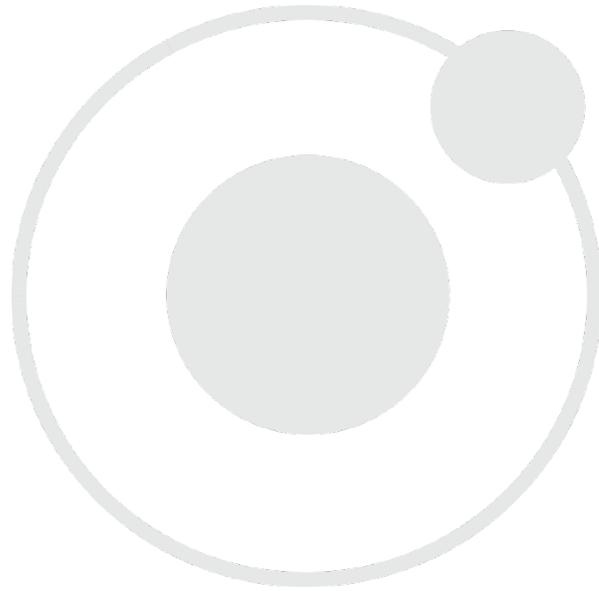
Managing condensation primarily depends on either lowering the humidity level or increasing the air temperature in the incubation chamber.

Note: Rising or falling air pressure from the weather will adjust the dew point up and down in small increments. If the relative humidity in the incubation chamber is already near the dew point, barometric fluctuations may push it across the threshold.

Note: Thin air at higher altitudes holds less humidity than the denser air found at or near sea level.

If excessive condensate has appeared in the incubation chamber, **dry the chamber interior.** After removing the condensate, check the following.

- Ensure samples on the shelves are evenly spaced to allow for good airflow.
- Ensure the chamber door is closing and latching properly.
- Verify the chamber access port is closed. The shipping cap that came with the unit should be installed on the outside of the incubator and not in the chamber.
- Are frequent or lengthy chamber door openings causing significant temperature disruptions and chilling the chamber surfaces? If so, reduce the number of openings.
- Are there too many open or “breathable” containers of evaporating sample media in the chamber? If so, reduce the number of open sample containers.
- Does the ambient humidity in the room exceed the stated operating range of 80% relative environmental humidity? If so, lower the room humidity.
- Is the incubator exposed to an external flow of cold air such as an air-conditioning vent or a door to a cooler hallway or adjacent room? Block or divert the air or reposition the unit.
- Check the door gasket for damage, wear, or signs of brittleness or dryness. Arrange for replacement of the gasket if damaged or excessively worn.



USER MAINTENANCE

Warning: Disconnect this unit from its power supply prior to performing maintenance or services.

Avertissement: Débranchez cet appareil de son alimentation électrique avant d'effectuer la maintenance ou les services.



CLEANING AND DISINFECTING

If a hazardous material or substance has spilled in the unit chamber, immediately initiate your site Hazardous Material Spill Containment protocol. Contact your local Site Safety Officer and follow instructions per the site policy and procedures.

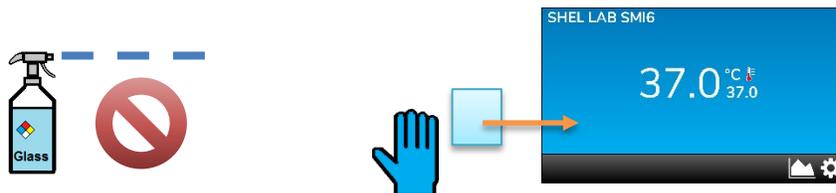
- Periodic cleaning and disinfection are required.
- Do not use spray on cleaners or disinfectants. These can leak through openings and coat electrical components.
- Consult with the manufacturer or their agent if you have any doubts about the compatibility of decontamination or cleaning agents with the parts of the equipment or with the material contained in it.
- Do not use cleaners or disinfectants that contain solvents capable of harming paint coatings or stainless steel surfaces. **Do not use chlorine-based bleaches or abrasives; these will damage the chamber liner.**

Warning: Exercise caution if cleaning the unit with alcohol or flammable cleaners. Always allow the unit to cool down to room temperature prior to cleaning and make sure all cleaning agents have evaporated or otherwise been completely removed prior to putting the unit back into service.

Avertissement: Soyez prudent lorsque vous nettoyez l'appareil avec de l'alcool ou des produits de nettoyage inflammables. Laissez toujours refroidir l'appareil à la température ambiante avant le nettoyage et assurez-vous que tous les produits de nettoyage se sont évaporés ou ont été complètement enlevés avant de remettre l'appareil en service.



Cleaning and Disinfecting the Display Screen



- Do not spray cleaning or disinfecting agents directly onto the screen.
 - Spray onto a lint-free soft wipe or cloth, then apply.
- The manufacturer recommends non-chlorine-based wipes to clean and disinfect with.
 - Isopropyl alcohol wipes are acceptable.
- If the incubator is powered, begin cleaning by placing the cleaning and disinfecting wipe on a blank region of the display screen.
 - Wipe across the screen surface while maintaining continual contact. This avoids triggering buttons.

Cleaning

Keep the following in mind when cleaning the unit:

- Always disconnect the unit from its power supply.
- Remove all removable accessory components such as shelving if permitted by your laboratory protocol.
- Clean the unit with a mild soap and water solution, including all corners.
 - **Do not use an abrasive cleaner.** These will damage metal surfaces.
 - **Do not use deionized water to rinse or clean with.**
 - Take special care when cleaning around the temperature sensor probes in the chamber to prevent damage. Do not clean the probes.
- Rinse with distilled water and wipe dry with a soft cloth.

Disinfecting

When disinfecting the unit:

- Always turn off and disconnect the unit to safeguard against electrical hazards.
- For maximum effectiveness, disinfection procedures are typically performed after cleaning.
- Disinfect the unit chamber using commercially available disinfectants that are non-corrosive, non-abrasive, and suitable for use on stainless steel and glass surfaces. Contact your local Site Safety Officer for detailed information on which disinfectants are compatible with your applications.
- If permitted by your protocol, remove all removable interior accessories (shelving and other non-attached items) from the chamber.
- Disinfect all surfaces in the chamber, making sure to thoroughly disinfect the corners. Exercise care to avoid damaging the sensor probes.
- Gas concentrations from evaporating disinfecting agents can inhibit growth or cause metabolic symptoms in microbiological sample populations. Make sure that chlorines, quaternary ammonias, or any other overtly volatile disinfecting agents have been rinsed or otherwise removed from the chamber surfaces, prior to placing samples in the chamber.

When disinfecting external surfaces, use disinfectants that will not damage painted metal, glass, and plastic.

MINIMIZING CONTAMINATION EXPOSURE

Suggestions for minimizing exposure of the incubator chamber to potential contaminants.

- Maintain a high air quality in the laboratory workspaces around the incubator.
- Avoid placing the incubator near sources of air movement such as doors, air vents, or high traffic routes in the workspace.
- Minimize the number of times the incubator chamber door is opened during normal operations.

STORING THE INCUBATOR

Perform the following steps if the incubator will be out of use for more than 24 hours to prevent microbiological contamination such as fungus or mold.

1. Depower the incubator.
2. Clean and disinfect if required by your laboratory protocol or if the chamber has been exposed to pathogenic microorganisms.
3. Use a soft cloth to dry the chamber surfaces.

DOOR COMPONENTS

Periodically, inspect the door latch, trim, catch, and gaskets for signs of deterioration. Failure to maintain the integrity of the door system shortens the life span of the unit.

ELECTRICAL COMPONENTS

Electrical components do not require maintenance. If the incubator fails to operate as specified, please contact your distributor or [Technical Support](#) for assistance.

CALIBRATING THE TEMPERATURE DISPLAY



Note: Performing a temperature display calibration requires a temperature reference device. Please see the [Reference Sensor Device](#) topic on page 9 for the device requirements.

Note: Each SMI12 incubation chamber must be independently calibrated to its temperature display.

Temperature calibrations are performed to match the unit temperature display to the actual air temperature inside the unit chamber. The actual air temperature is supplied by a calibrated reference device. Calibrations compensate for long-term drifts in the incubator microprocessor controller as well as those caused by the natural material evolution of the sensor probe in the heated incubator chamber. Calibrate as often as required by your laboratory or production protocol, or regulatory compliance schedule. Always calibrate to the standards and use the calibration setup required by your industry requirements or laboratory protocol.

A suggested calibration setup

1. Introduce the reference device thermocouple probe through the access port on the right side of the unit.

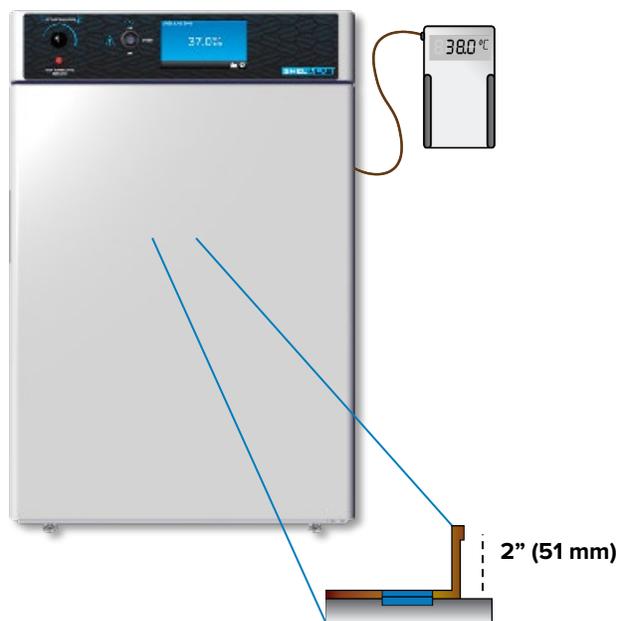
2. Position the sensor probe head as close as possible to the geometric center point of the chamber. The probe head must be at least 2 inches (51 mm) above or below shelving surfaces to prevent heat sinking. Secure the probe head in position using the non-stick tape.

3. After securing the probe head in position, carefully place the access port stopper in the port over the probe wires. Use non-stick tape to seal any gaps created between the stopper and the port by the probe wires.

4. The incubator door must be closed and latched. Failure to do so will prevent an accurate calibration.



Heat-resistant non-stick tape recommended

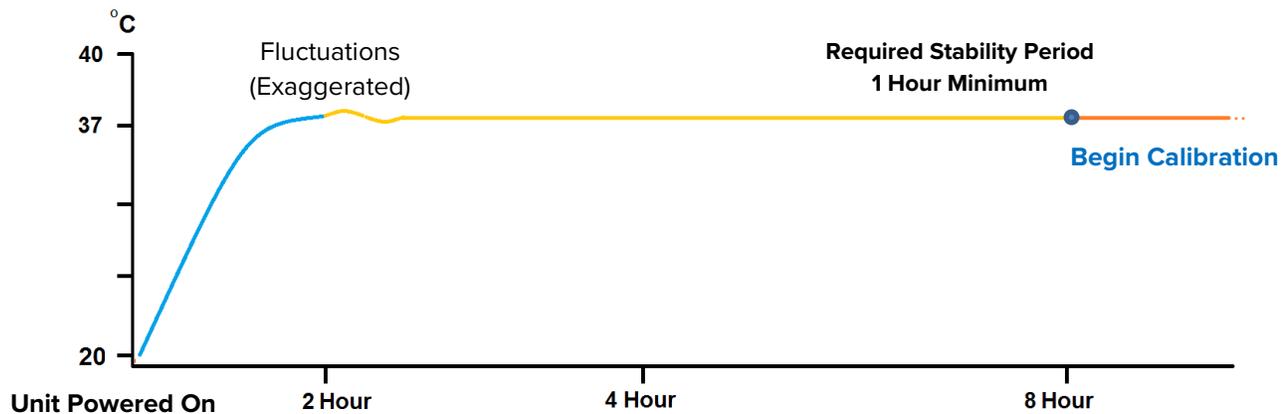


Continued next page

MAINTENANCE

5. The unit temperature must be stable in order to perform an accurate calibration.

- The incubator must run for at least 8 hours prior to conducting a calibration.
- The temperature is considered stabilized when the incubation chamber has operated with the door closed at your calibration temperature for at least 1 hour with no fluctuations greater than the specified stability of the incubator (see page 54).



Suggested Calibration Procedure

1. Once the incubator temperature has stabilized, compare the reference device and incubator temperature display readings.



Reference Device

Unit in Calibration



Reference Device

Calibration Required



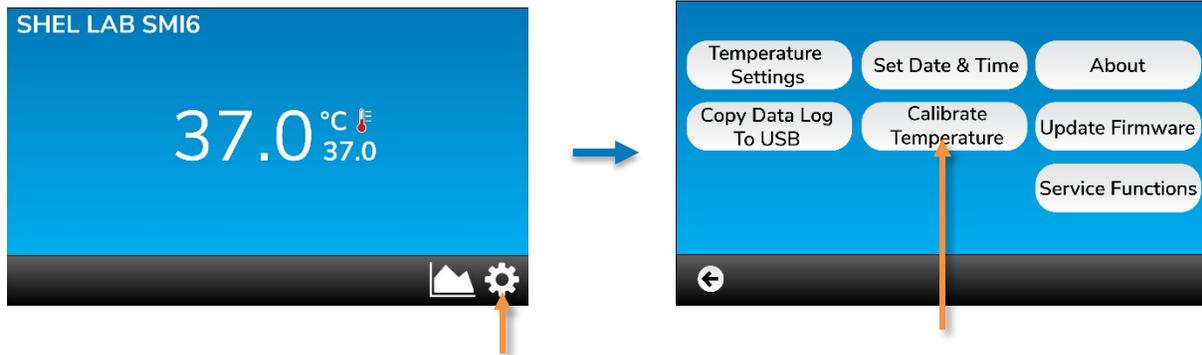
- If the readings are the same, or the difference between the two falls within the acceptable range of your protocol, the display is accurately showing the chamber air temperature. **The Temperature Calibration procedure is now complete.**
- If the difference falls outside of your protocol range, advance to the next step.

MAINTENANCE

Temperature Calibration Continued

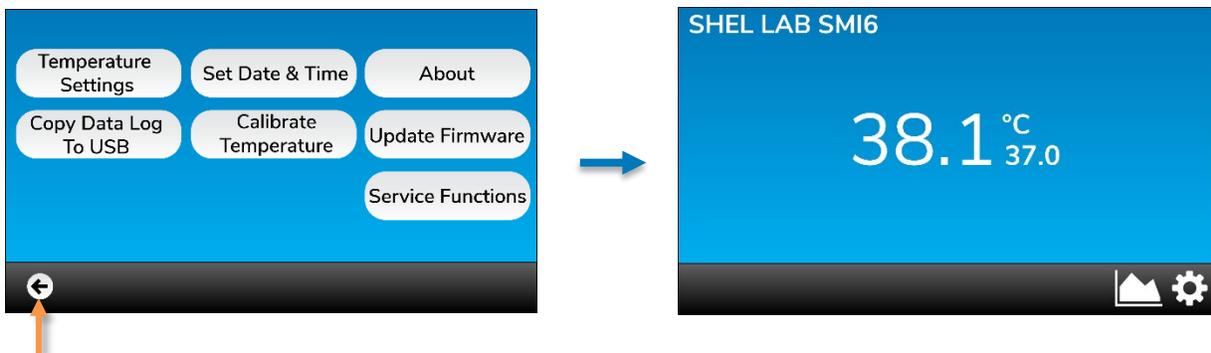
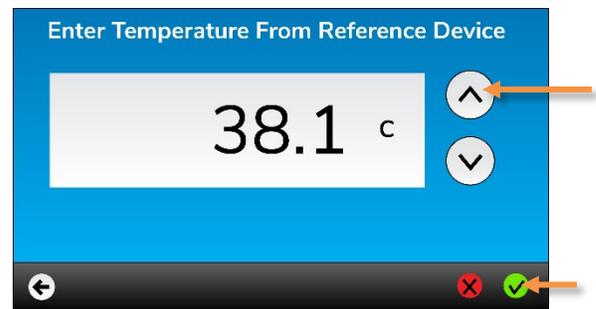
2. Open the Calibrate Temperature menu.

- a. Tap the Settings button.
- b. Tap the Calibrate Temperature button.



3. Match the incubator display temperature to the reference device.

- Tap the Up and Down arrow buttons.



- a. Tap the green checkmark button to save the new temperature and return to the Settings menu.
 - The unit will begin heating or cooling to achieve the new set point.
- b. Tap the left arrow button to return to the homepage.



Continued next page

MAINTENANCE

Temperature Calibration Continued

4. Allow 1 hour for the incubator temperature to stabilize.

- Failure to wait until the incubator is fully stabilized will result in an inaccurate reading.



Wait 1 Hour



5. Compare the reference device and display temperature readings.



Reference Device

Unit in Calibration



Reference Device

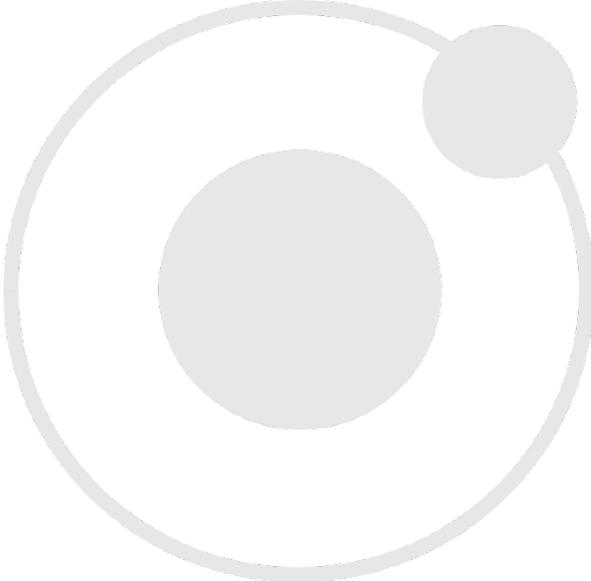
Further Calibration Required



- If the reference device and the chamber temperature display readings are now the same or the difference falls within the range of your protocol, **the incubator is now calibrated for temperature.**
- If the difference still falls outside the acceptable range of your protocol, repeat the calibration procedure up to 2 more times.

If the temperature readings of the incubator temperature display and the reference device still fall outside your protocol after 3 calibration attempts, contact your distributor or [Technical Support](#) for assistance.

End of procedure



UNIT SPECIFICATIONS

These incubators are 100 – 120 volt units. Please refer to the unit data plate for individual electrical specifications.

Technical data specified applies to units with standard equipment at an ambient temperature of 25°C and at nominal voltage. The temperatures specified are determined in accordance with factory standard following DIN 12880 respecting the recommended wall clearances of 10% of the height, width, and depth of the inner chamber. All indications are average values, typical for units produced in the series. We reserve the right to alter technical specifications at all times.

WEIGHT

Model	Shipping	Net Weight
SMI2	117 lb / 53 kg	83.0 lb / 37.6 kg
SMI6	187 lb / 85 kg	158.0 lb / 71.7 kg
SMI7	198 lb / 90 kg	162.0 lb / 73.5 kg
SMI11	300 lb / 136 kg	217.0 lb / 98.5 kg
SMI12	550 lb / 250 kg	316.0 lb / 143.3 kg

DIMENSIONS

In Inches

Model	Exterior W × D × H	Interior W × D × H
SMI2	21.3 × 22.3 × 26.0 in	15.0 × 15.0 × 15.2 in
SMI6	25.3 × 27.3 × 38.0 in	19.5 × 20.0 × 26.0 in
SMI7	30.0 × 31.0 × 32.0 in	23.7 × 24.0 × 20.0 in
SMI11	42.0 × 27.0 × 38.0 in	36.2 × 20.0 × 26.0 in
SMI12	25.3 × 27.3 × 76.0 in	19.5 × 20.0 × 26.0 in*

*The interior dimensions are for each SMI12 chamber

In Millimeters

Model	Exterior W × D × H	Interior W × D × H
SMI2	541 × 566 × 660 mm	381 × 381 × 386 mm
SMI6	643 × 693 × 965 mm	495 × 508 × 660 mm
SMI7	762 × 787 × 813 mm	602 × 610 × 508 mm
SMI11	1067 × 686 × 965 mm	920 × 508 × 660 mm
SMI12	643 × 693 × 1930 mm	495 × 508 × 660 mm*

*Each Chamber

SPECIFICATIONS

CAPACITY

Model	Cubic Feet	Liters
SMI2	2.0	56.3
SMI6	5.9	166.0
SMI7	6.5	184.0
SMI11	10.9	309.0
SMI12	11.7	332.0

SHELF CAPACITY BY WEIGHT

Model	Per Shelf *	Total **	Max. Shelves per Unit
SMI2	35.0 lb / 15.9 kg	70.0 lb / 31.8 kg	6
SMI6	35.0 lb / 15.9 kg	105.0 lb / 47.6 kg	12
SMI7	35.0 lb / 15.9 kg	70.0 lb / 31.8 kg	9
SMI11	35.0 lb / 15.9 kg	105.0 lb / 47.6 kg ***	12
SMI12	35.0 lb / 15.9 kg	105.0 lb / 47.6 kg ****	12

* Weight evenly distributed across the shelf.

** Total load for the for the incubation chamber. Exceeding this limit risks damaging the chamber liner.

*** For each side of the SMI11 chamber. 210 lb / 95 kg total maximum both sides.

**** For each SMI6 in a SMI12 stack. 210 lb / 95 kg total maximum for both chambers.

TEMPERATURE

Model	Range	Uniformity	Stability
All	Ambient +8° to 70°C	±0.5° @ 37°C	±0.1°C @ 37°C

POWER

Model	Voltage	Amperage	Frequency
SMI2	100 – 120	4.5	50/60 Hz
SMI6	100 – 120	6.0	50/60 Hz
SMI7	100 – 120	6.5	50/60 Hz
SMI11	100 – 120	10.0	50/60 Hz
SMI12	100 – 120	12.0 (6.0 each chamber)	50/60 Hz

PARTS LIST

Description	Parts Number	Description	Parts Number
Fuse, 6.3 amp 250V, SMI2, SMI6, SMI12	 3300515	Shelf, SMI6, SMI12	 5130523
Fuse, 10 amp 250V, SMI7, SMI11	 3300516	Shelf Mount, SMI6, SMI12	 5081201
Leveling Foot	 2700512	Shelf, SMI7	 5130518
Power Cord 125-volt 15 amp, 9ft 5 in (2.86m) NEMA 5-15P	 1800510	Shelf Mount, SMI7	 5081205
Shelf, SMI2	 5080758	Shelf, SMI11	 5130687
Shelf Mount, SMI2	 5081174	Shelf Mount, SMI11	 5081201

Ordering

Accessories and replacement parts can be ordered online at parts.sheldonmfg.com.

If the required item is not listed online, or if you require assistance in determining which part or accessory you need contact SHEL LAB by emailing parts@sheldonmfg.com or by calling 1-800-322-4897 ext. 4 or (503) 640-3000 ext. 4.

Please have the **model**, **serial**, and **part** numbers and **Part ID** of the unit ready. Tech Support needs this information to match your unit to its correct part.



SHELDON
MANUFACTURING, INC

P.O. Box 627
Cornelius, OR 97113
USA

support@sheldonmfg.com
sheldonmanufacturing.com

1-800-322-4897
(503) 640-3000
FAX: 503 640-1366