

Heat Treatment Incubator System with Timer  
 Forced Air Incubator

**DESCRIPTION**

The P4800 Heat Treatment Incubator, supplied by VWR, is a dosimeter heat treatment system comprised of a forced air incubator, a timer and a thermometer. This system provides excellent incubator performance which offers improved temperature uniformity, uniform heating, precise temperature control, and fast drying capabilities through the use of a blower that circulates heated air in a horizontal airflow pattern. A microprocessor control system ensures temperature accuracy, and a temperature sensor which offers repeatability and stability over extended use.

This incubator features a 1.3" stainless steel ventilation cap, two doors (one solid, one glass), high temperature grade foamed silicone rubber door gaskets, RS-232C interface for monitoring and controlling with PC (optional - software not provided), current and temperature protection, and sensor error detection. Units are constructed with a durable, powder-coated steel exterior, stainless steel interior and two stainless steel shelves. A locking mode assists in preventing unintended temperature changes. Units include one interior outlet (120V, 60Hz, 1amp).

**APPLICATION(S)**

The P4850 Forced Air Incubator is used for the post-irradiation heat treatment or annealing of radiochromic dosimeters to achieve dosimeter stability.

**SPECIFICATIONS**
**Physical Specifications:**

Chamber Volume	32L (1.1 cu.ft.)
Chamber Dimensions	29cm (d) x 31cm (d) x 36cm (h) (11.4" x 12.2" x 14.2")
Temperature Range	Ambient +8° to 60°C
Temperature Uniformity	±0.2° at 37°C and ±0.3° at 50°C
Temperature Setting Accuracy	± 0.1°C
Temperature Variation (°C)	±0.6°C at 37°C, ±1.0°C at 50°C
Voltage Range	120V, 60Hz, 163.9W
Inner AC Outlet Rating	120V, 60Hz, 1A / Fuse: 250V F1AH
Heat-up Time	17 - 22 min. to 37°C, 30 - 35 min. to 50°C, 45 - 120 min. to 65°C
Recovery Time	3 - 5 min. to 37°C, 4 - 6 min. to 50°C, 6 - 10 min. to 65°C
Shipping Weight	101.4 lbs. / 46 kg

**Included Components**

- Advanced, Adaptive, Microprocessor control resulting in superior Temperature Accuracy
- High-quality LCD display with backlight
- Rotary knob interface
- 110V cord and plug
- Two stainless steel shelves
- Inner AC Outlet

**Storage**

Store at room temperature (15-25°C). Intended for indoor use; do not use in a location where ambient room temperatures falls below 5°C and rises above 40°C. The maximum relative humidity is 80% at 31°C and 50% at 40°C. Device should be located in a well ventilated location; ensure ventilation holes on the side or rear surface of the body are not blocked by a wall or an object; it may cause fire or damage if not able to properly reject heat or insufficient ventilation may result. Place product on level, horizontal surface to support the weight of product without vibration.

**Environmental Influences**

Avoid areas where the sun shines directly on the product and not install where it can get damp or in a dusty environment; it could cause overheating or a short circuit.

Do not install in a location at altitude over 2,000 meters (6,562 ft.) Do not operate near heater or air-conditioner. Do not operate the product in the presence of flammables; it could cause explosion or fire.

## **USAGE**

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### **How to Use:**

- Please refer to the VWR Operation Manual for detailed usage information (provided upon request).

### **GEX Technical Usage Information**

- 1) The post-irradiation heat-treatment specification temperature range (55°C to 65°C) can be used for the effective heat-treatment or annealing of B3 film dosimeters.
- 2) Ideal heat-treatment temperature is 58.5°C ±1.0°C.
- 3) Heat-treatment time: 15-20 minutes (minimum).
- 4) Please reference GEX Technical Report #100-201: *Post-Irradiation Heat-Treatment of B3 Dosimeters* for additional details (see References).

### **Setup and Installation**

- 1) Un-package and inspect for any shipping damage.
- 2) Using two people for transport, carefully move and place the incubator on a flat, stable, even surface with unobstructed airflow around the incubator and preferably away from air drafts. The recommended distance of each side is minimum of 20 cm from the back wall, and 100cm from the side walls and ceiling.
- 3) Ensure the surface used can withstand the radiated heat produced by typical incubators and does not vibrate.
- 4) Once the unit is placed in its installation location, let it sit for 15-30 mins to allow stabilization.
- 5) Plug power cord into a properly grounded power supply.
- 6) Insert the shelves at desired heights.
- 7) Note the timer is located on the inside chamber of the incubator, and has its own set of usage and calibration instructions. Attach it to the outside of the incubator using the magnetic attachments. It can also be attached to a belt or made to stand-up freely.

### **Site Acceptance Testing**

Internal temperature mapping validation is required by the end user to establish incubator location and time intervals.

### **Operation**

- **Digital LCD Display** – Indicates SV (set value) and PV (present value) of temperature and/or timer.
- **MAIN** button – Used to change MODE ‘Set Operation Time’, ‘Set Temperature’, and ‘Safety Locking’.
- **SUB** button – Used to change the SUB MODE ‘Set Delay Time’ and ‘Set Offset Value’
- **TIMER, HEAT, ERROR** LED Indicators – Indicate operation of Timer/Heater, Current Status, and Error by flickering.
- **Rotary Knob** – Used to set Temperature and/or Time by turning and then START/STOP by pushing the knob. Also used to save the Set Values by pushing the knob in each mode.
- **Main power switch** – Used to turn the unit on and off.
- **SAFETY** knob – Safety device which protects against uncontrolled overheating of the unit.
- **RS232 Connector** – Port for the cable connection to PC (optional)
- **SAFETY Protector** – Protects the product by cutting the power to the heater when unit overheats (over 80°C).

Note: If the safety protector has been activated, the heater will not auto-recover and must be reset manually to recover. See step X below on how to reset the safety protector.

#### 1. Preparation for Use:

- After turning the unit on, set the safety knob to 75.0°C.
- Before operation, ensure both doors are completely closed (a visual alarm and buzzer will sound if accidentally left ajar).

#### 2. Setting the Timer:

## Heat Treatment Incubator System with Timer Forced Air Incubator

- The initial mode after power up is 'Set Operation Timer' mode, the TIMER indicator flashes.
- 'Tim SV' on the LCD display indicates the set value of the timer and 'Tim PV' indicates the present value (remaining time) of the timer.
- Initial or set value (SV) of the time is 00:00, which means infinite time. That means this unit will operate (heat) continuously once the operation is started.
- Turn Rotary Knob, the SV and PV change together. SV can be set in 1 min. increments and the maximum value is 99:59.
- Set the required time using the Rotary Knob and push it to complete the timer setting. When the timer is started the unit continues to operate (heat) until the SV of the timer has expired.  
Note: When Operation Timer ends, alarm beeps three times.  
Note: When the Timer activates, Timer Indicator is lit on Temperature Mode or Locking Mode. In Timer Mode, the Timer Indicator flashes regardless of the Timer activation.

### 3. Set Delay Timer:

- Go to 'Set Delay Timer' mode by pushing the SUB button while in the Set Operation Timer mode. TIMER indicator flashes.
- 'DTim SV' on the LCD display indicates set value of the delay timer and 'DTim PV' indicates the present value (remaining time) of the timer.
- Set required delay time using the Rotary Knob and push it in to complete the timer setting. The timer is started and the TIMER lamp indicator is lit. The unit starts operation (heating) after the delay time has expired.
- Return to the Set Operation Timer mode by pushing the MAIN button.  
Note: After setting Operation Timer and/or Delay Timer, push the Rotary Knob for operation of the timers.  
Note: To change the Delay Timer Setting during operation, push the Rotary Knob once to stop operation and set timer accordingly. After completion of setting, push the knob once to restart.

### 4. Set Temperature:

- Go to 'Set Temperature' mode by pushing the MAIN button while in the Set Operation Timer mode.
- 'Temp SV' on the LCD display indicates the set temperature value, and 'Temp PV' indicates the present value of the interior chamber (measured by interior chamber sensor).
- Turn the Rotary Knob, the SV changes. The SV can be set in 0.1°C increments. The maximum value is 70°C.
- Set the required operating temperature using the Rotary Knob once to stop operation and set Temperature accordingly. After completion of setting, push the knob once to restart operation.  
Note: during heating, HEAT indicator flickers upon operation. During operation, PV Temp and Running and rotate on the display.

### 5. Temperature Offset (Calibration)

The Forced Air Incubator precisely controls the temperature inside the chamber by an advanced, adaptive microprocessor control. Some users may want or need to synchronize the PV temperature of the unit to the temperature value measured by a thermometer used as a reference check for the process. To perform this, the incubator offers a function to adjust the PV temperature within  $\pm 10.0^{\circ}\text{C}$ .

- Go to 'Set Offset Value' mode by pushing the SUB button while in the Set Temperature mode.
- 'Temp PV' on the LCD display indicates current temperature and 'Offset' indicates the value to be added to the PV temperature (compensation value).
- Turn the Rotary Knob, the Offset, and the Temp PV change together. Offset can be set in 0.1°C increments, and the input range is  $\pm 10.0^{\circ}\text{C}$ . Temp PV now shows the temperature value with the added or subtracted offset value.

## Heat Treatment Incubator System with Timer Forced Air Incubator

- Return to the Set Temperature mode by pushing the MAIN button.
- If Set Temperature Offset is accessed during operation (heating) it will be stopped. Operation can be restarted by pushing the Main button then the Rotary knob.

Note: After the adjustment, hold the knob for 1 second to save the set value and see the LCD display flickers twice. Recommend to store the offset value when you use a calibrated thermometer or the unit is used for personal application only. But if the unit is for public use or the adjustment is for temporary application, do not save the value. Otherwise it may affect other applications.

### 6. Locking Mode

- Recommended that while unit is in operation (heating) that unit is set to Locking Mode.
- Go to 'Locking' mode by pushing the MAIN button while in the Set Temperature mode. In this mode, turning or pushing the knob has no effect on unit.
- Operation Timer PV and Temp PV are shown on the LCD display.
- Return to Set Operation Timer mode by pushing MAIN button.
- If you need to set Temperature, push the MAIN button again while in the Set Operation Timer mode.

### 7. Storage Function

- In each setting mode, you can store the set values by pushing and holding the Rotary Knob for 1 second. To show the value is successfully stored, the set value on the LCD display flashes twice. Even though the unit is turned off, the set values are stored permanently for future use.

### 8. Function of Auto Recovery at Power Failure

- In the event of unexpected power disruption, an automatic recovery function recovers the status of the last operation as follows:
- Activating the function – If you saved the current operating temp SV value, the unit will start operation with the saved Temp SV automatically without manually setting/starting again upon powering on.  
Note: Timer and Delay Timer values are not activated after auto recovery.
- Deactivating the function – If you turn the Rotary Knob counterclockwise all the way in Set Temperature mode, 0°C will be displayed after 25°C. If you *save this zero value Temp SV by pushing the Rotary Knob for 1 second*, the unit will stay at the initial status without operating automatically upon power up. Use this mode only when you don't need the automatic recover of operation after power loss.

Note: Once power is restored, the display automatically shows the Temperature Running Mode.

#### **Calibration:**

Each individual company's standard operating procedures will dictate the calibration frequency of included components.

#### **Typical industry practices**

- Incubator – accuracy is verified by comparing the value of the digital display against a NIST calibrated digital thermometer.
- Timer – annually, or at replacement.

#### **MAINTENANCE**

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##### **Cleaning:**

1. Before cleaning the unit, ensure the power is off.
2. Use Isopropyl Alcohol and a lint-free wipe to clean.

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 Forced Air Incubator

- Do not use a large amount of water, Benzene, Thinner, or any alcohol for cleaning; it may cause discoloration, damage, electric shock, or fire.

**PRODUCT PHOTOS**

**ACCESSORIES**

GEX Part No.	Description	Purpose	Link
P4120	Genesys 20 Spectrophotometer	For measuring the optical absorbance of dosimeters Integrated to communicate directly with GEX WINdose software for automated data-transfer	<a href="http://gexcporation.com/pdf/100-127_P4120_Genesys20_PI_090110.pdf">http://gexcporation.com/pdf/100-127_P4120_Genesys20_PI_090110.pdf</a>
P4502	WINdose Hinged Dosimeter Holder	Dosimeter holder for Genesys 20 spectrophotometer	<a href="http://gexcporation.com/pdf/100-116_P4502_Hinged_Holder_PI_082304.pdf">http://gexcporation.com/pdf/100-116_P4502_Hinged_Holder_PI_082304.pdf</a>
P4506	DoseStix Dosimeter Holder	Dosimeter holder for Genesys 20 spectrophotometer	<a href="http://gexcporation.com/pdf/100-106_P4506_DoseStix_Holder_PI_082304.pdf">http://gexcporation.com/pdf/100-106_P4506_DoseStix_Holder_PI_082304.pdf</a>
P4900	Micro-Incubator Development System	Post-irradiation treatment of radiochromic dosimeters to achieve stability	<a href="http://gexcporation.com/pdf/100-123_P4900_Micro_Incubator_PI_102908.pdf">http://gexcporation.com/pdf/100-123_P4900_Micro_Incubator_PI_102908.pdf</a>
P8005	PENVAC Dosimeter Handling Tool	Dosimeter handling	<a href="http://gexcporation.com/pdf/100-118_P8005_PENVAC_PI_021413.pdf">http://gexcporation.com/pdf/100-118_P8005_PENVAC_PI_021413.pdf</a>
P8006	Dosimeter Handling Forceps – 4.5 inch curved	Dosimeter handling	<a href="http://www.gexcpcorp.com/purchase-pricelist.php">http://www.gexcpcorp.com/purchase-pricelist.php</a>
S5100	WINdose for Excel worksheet program	Integrated with P4120 Spectrophotometer for automated data-transfer	<a href="http://gexcporation.com/pdf/100-153%20S5100-WINDose%20for%20Excel%2002%20Manual_100213.pdf">http://gexcporation.com/pdf/100-153%20S5100-WINDose%20for%20Excel%2002%20Manual_100213.pdf</a>

**LIMITATIONS/PRECAUTIONS**

Only use a power outlet which as a ground terminal. The product should be connected to the rated power supply as specified on the label on the rear side of the unit, AC 120V/60Hz, 15A. If the product is connected to wrong power source it may cause overheating.

**HEALTH/ENVIRONMENTAL INFORMATION**

Do not touch with wet hands; it may cause an electric shock.

**WARRANTY/GUARANTEE**
**Warranty:**

2 year manufacturer's warranty when used in laboratory conditions and according to proper operating instructions.

**Heat Treatment Incubator System with Timer  
Forced Air Incubator****Guarantee:**

1 year GEX satisfaction guarantee. May be returned with or without reason with one year from the date of delivery.

**REFERENCES**

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**References:**

- VWR Operation Manual (Version 2.0.0)
- ISO/ASTM 51261: Practice for calibration of routine dosimetry systems for radiation processing
- ISO/ASTM 51275: Practice for use of a radiochromic film dosimetry system
- ISO/ASTM 51707: Guide for estimating uncertainties in dosimetry for radiation processing
- ISO/ASTM 52628: Describes the basic requirements that apply when making absorbed dose measurements in accordance with the ASTM E61 series of dosimetry standards. In addition, it provides guidance on the selection of dosimetry systems and directs the user to other standards that provide specific information on individual dosimetry systems, calibration methods, uncertainty estimation and radiation processing applications.
- ISO/ASTM 52701: Guide for performance characterization of dosimeters and dosimetry systems for use in radiation processing
  
- NPL CIRM 29 Guidelines for the Calibration of Dosimeters for use in Radiation Processing, Peter Sharpe and Arne Miller, 1999; National Physical Laboratory, Teddington, UK.
  
- Miller A., Batsberg W. and Karman W. (1988); A New Radiochromic Thin-Film Dosimeter System; Radiation Physics and Chem. Volume 31, Nos 4-6, Elsevier Science Ltd. Pergamon Press, Great Britain.
  
- Abdel-Fattah A. A. and Miller A. (1996); Temperature, Humidity, and Time. Combined Effects on Radiochromic Film Dosimeters; Radiation Physics and Chem. Vol. 47, No. 4 pp 611-621, Elsevier Science Ltd. Pergamon Press, Great Britain.

**GEX Procedures:**

- [100-253: Dosimetry Lab Requirements](#)
- [100-258: Measuring GEX Dosimeters](#)
- [100-259: Investigation of B3 WINDose Measurements](#)
- [100-260: Energy Estimation](#)
- [100-261: Uniformity Measurement](#)

**GEX Technical Reports:**

- [100-201 Post-Irradiation Heat-Treatment of B3 Dosimeters](#)

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