High-performance Clean Oven

PVHC–231MS · 331MS · PV(H)C–211 · 231 · 331
Ideal for heat treatment requiring air condition of Class 100 cleanliness. The high cleanliness is assured during the temperature heat-up and pull-down.

ESPEC's Clean Ovens are used extensively for heat treatment of specimens and drying components in stringent clean air requirements of Class 100 cleanliness. A space-saving upright design, and a large LED display for improved visibility are some of the user-friendly features.

Eight models to choose from, including high-performance models which ensure automated operation and dedicated cleanliness even throughout temperature heat-up or cooling procedures.
Class 100 Cleanliness Level

Class 100 cleanliness level is achieved by employing HEPA filters and a back-to-front horizontal laminar circulation system which produces uniform high-temperature airflow. Distance of airflow in the chamber is shortened, resulting in smooth air delivery in between specimens and uniform heat treatment. Additionally, it prevents dust generated from specimens placed upstream from flowing downstream. The upright design with instrumentation, heater, and other mechanisms gathered on the upper side saves installation space.

Airtight Structure Ensures Zero Contamination

All internal seams are welded to create an airtight structure. This prevents leakage of insulation materials from joints which would lead to chamber contamination. Vibration is also eliminated from affecting the specimens.

Installation in a clean room

Any dust generated by the oven mechanism is expelled via exhaust duct to prevent accidental infiltration into the clean room. (optional/ please be prepared with your own exhaust duct) The exterior material of the chamber can also be exchanged with an optional stainless steel material.

Highly Precise Non-Oxidative Environment

Heat treatment and temperature characteristic tests in any desired non-oxidized environment are possible thanks to an O₂ concentration indication adjuster with oxygen sensor (optional) and an N₂ gas injector (optional).

Two Types of Easy-to-Use Instrumentation

Standard instrumentation for two-step programmed operation and M instrumentation for programmed operation with three patterns and a total of 18 steps are provided. A large LED display is employed for improved visibility.

Total Safety Design

The temperature controller automatically prevents the temperature rising by +10 °C above the set temperature, and includes a warning function for user-defined upper and lower temperature limits. The chamber also features an independent device for preventing abnormal temperature increases. If a malfunction occurs, an alarm number is displayed on the instrumentation panel and a warning buzzer sounds.
**Automated Operation throughout Heat Treatment Process (High-performance model)**

An automatic damper is provided as standard for automation in all processes from temperature heat-up to heat treatment and temperature pull-down. To reduce pull-down time, an optional external atmosphere introducing blower forces air into the chamber to supplement cooling.

**High Level of Cleanliness During Temperature heat-up and pull-down (High-performance model)**

The high-performance model delivers dedicated cleanliness throughout wide temperature ranges by employing HEPA filters which provide stable filtering even during temperature changes above +150°C. Useful for heat treatment in liquid crystal production lines.

**Control, monitor, and data management is performed via personal computer.**

The application software makes it easy to set test parameters, monitor operations, program, and datalog up to 16 ESPEC test chambers with a single PC by remote control.

*Software: English/Chinese (in simplified)/Japanese.*
The instrumentation features four programmed operation modes: fixed operation, automatic start/stop programmed operation, two-step programmed operation, and a ramping operation that allows temperature increase gradient to be specified.

A large display with touch keys is employed for improved operation.

The ovens can also be used with centralized control systems involving high-level programmed operation, remote operation and central control using a personal computer. Ideal for use in production lines and research development.

### Example of programmed operation

<table>
<thead>
<tr>
<th>1. Automatic start</th>
<th>2. Automatic stop</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temp.</td>
<td>Temp.</td>
</tr>
<tr>
<td>1st step</td>
<td>2nd step</td>
</tr>
<tr>
<td>Time</td>
<td>Time</td>
</tr>
</tbody>
</table>

**Stepwise program**

<table>
<thead>
<tr>
<th>1. Ramp program</th>
<th>2. Step + ramp program</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temp.</td>
<td>Temp.</td>
</tr>
<tr>
<td>1st step</td>
<td>2nd step</td>
</tr>
<tr>
<td>Time</td>
<td>Time</td>
</tr>
</tbody>
</table>

**End of program**

<table>
<thead>
<tr>
<th>1. HOLD</th>
<th>2. CONST</th>
<th>3. OFF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time</td>
<td>Time</td>
<td>Time</td>
</tr>
</tbody>
</table>

*The number of repetitions of a program can be preset between 1 and 999.*

Stepwise damper setting is possible. (optional automatic damper required for PVC/PVHC).

Guaranteed by soak function can be set, whereby the timer is activated upon achieving set temperature.

### Standard Instrumentation Specifications

<table>
<thead>
<tr>
<th>Operation mode</th>
<th>Constant operation, programmed operation and remote operation through E-BUS system</th>
</tr>
</thead>
<tbody>
<tr>
<td>Setting and indication ranges</td>
<td><strong>temperature</strong>: 0 to +210°C (PVC) 0 to +360°C (PVHC) <strong>time</strong>: 0 to 99 hours 59 minutes to 100 to 999 hours (in 1 hour increments)</td>
</tr>
<tr>
<td>Setting and indication resolution</td>
<td><strong>temperature</strong>: 1 °C <strong>time</strong>: 1 minute</td>
</tr>
<tr>
<td>Indication accuracy*</td>
<td><strong>temperature</strong>: within ±(2°F × 1 digit) <strong>time</strong>: ±300 ppm of readout value</td>
</tr>
<tr>
<td>Programming function</td>
<td>Two-fixed-step program entry is possible. Ramp setting Stepwise temperature ramp setting is possible. Automatic start Timed start-up is possible by setting the first step to 0°C (i.e. OFF mode). Automatic stop Timed termination is possible by setting the oven to turn OFF upon completion of a program. OFF mode The oven can be turned off during programmed operation. Completion The operating status upon completion of a program can be set to HOLD, CONST or OFF. Repetition A program can be repeated automatically up to 999 times.</td>
</tr>
<tr>
<td>Communications</td>
<td>E-BUS system compatible.</td>
</tr>
<tr>
<td>Auxiliary functions</td>
<td>Input burnout detection Upper and lower temperature limit alarm Buzzer alarm Automatic overheat prevention Fault indicator Automatic number indication Self diagnosis Guarantee soak testing Operation mode switching from failure to power recovery Power failure/recovers operation selection</td>
</tr>
</tbody>
</table>

*At ambient temperature +23°C ±5°C
The M-instrumentation allows programmed operations up to three patterns with 18 steps in total for temperature characteristics testing, heat treatment, and drying. Its advanced functions include temperature heat-up and pull-down temperature gradient settings, repeated operations (up to 999 cycles), setting of operation status on completion of a program (HOLD, CONST or OFF), and automatic program start/stop at any chosen time. Compatible with centralized control system to allow construction of PC-based network of temperature chambers.

**Example of programmed operation**

<table>
<thead>
<tr>
<th>Step program*</th>
<th>Ramp program*</th>
<th>Automatic start*</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Step program graph" /></td>
<td><img src="image2" alt="Ramp program graph" /></td>
<td><img src="image3" alt="Automatic start graph" /></td>
</tr>
</tbody>
</table>

* The number of repetitions of a program can be preset between 1 and 999.  
  1 to 9 stepwise damper setting is possible. (optional automatic damper required for PVCPVHC).  
  Guarantee soak function can be set, whereby the timer is activated upon achieving set temperature.

**M-Instrumentation Specifications**

<table>
<thead>
<tr>
<th>Operation mode</th>
<th>Constant operation, programmed operation and remote operation through E-BUS system</th>
</tr>
</thead>
</table>
| Setting and indication ranges | temperature: 0 to + 210 °C (PVC)  
  0 to + 310 °C (PV/HC-MS)  
  0 to + 360 °C (PVHC)  
  time: 0 to 99 hours 59 minutes  
  100 to 999 hours (in 1 hour increments) |
| Setting and indication resolution | temperature: 1 °C  
  time: 1 minute |
| Indication accuracy* | temperature: within ± (2% + 1 digit)  
  time: ± 300 ppm of readout value |
| Programming function | Three-pattern, 18-step program entry is possible.  
  Ramp setting  
  Stepwise temperature ramp setting is possible.  
  Automatic start  
  Timed start-up is possible by setting the first step to 0°C (or OFF mode).  
  Automatic stop  
  Timed termination is possible by setting the oven to turn OFF upon completion of a program.  
  Completion  
  The oven can be turned off during programmed operation. |
| Communications | E-BUS system compatible. |
| Auxiliary functions | Input burnout detection  
  Upper and lower temperature limit alarm  
  Buzzer alarm  
  Automatic overheat prevention  
  Fault indication  
  Alarm number indication  
  Self diagnosis  
  Guarantee soak testing  
  Power failure/recovery operation selection  
  Power failure protection |

*At ambient temperature +23°C ± 5°C
### SPECIFICATIONS

<table>
<thead>
<tr>
<th>Model</th>
<th>PVC-211</th>
<th>PVC-231</th>
<th>PVC-331</th>
<th>PVHC-211</th>
<th>PVHC-231</th>
<th>PVHC-331</th>
<th>PVHC-231MS</th>
<th>PVHC-331MS</th>
</tr>
</thead>
<tbody>
<tr>
<td>System</td>
<td>Back-to-front horizontal laminar circulation system</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power supply</td>
<td>200/220/230V AC, 3/5, 3W, 50/60Hz</td>
<td>380V AC, 3/5, 4W, 50/60Hz</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max. power consumption</td>
<td>4.1kVA</td>
<td>6.4kVA</td>
<td>7.0kVA</td>
<td>4.1kVA</td>
<td>6.8kVA</td>
<td>9.0kVA</td>
<td>6.8kVA</td>
<td>9.0kVA</td>
</tr>
<tr>
<td>Operating temperature</td>
<td>0 to +40°C</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature range</td>
<td>(Ambient temp +60°C) to +200°C</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature constancy</td>
<td>0.5°C</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature Uniformity</td>
<td>1.5°C at +100°C</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature heat-up rate</td>
<td>Ambient temp to +200°C within 60 min</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clearance</td>
<td>At stable temp: Class 100</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exterior material</td>
<td>Iron sieve HEPA filter</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interior material</td>
<td>High-temperature HEPA filter</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insulation material</td>
<td>Sheathed heater</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Air circulator</td>
<td>Iron sieve HEPA filter with heat resistant finish</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Damper</td>
<td>Circulation/Ventilation (manual switching)*3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fittings</td>
<td>Power cord 2m, specimen power supply control terminal, pressure gauge (indicates life of filter), cable port 125mm (one on left panel)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inside dimensions</td>
<td>580 x 530 x 580</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outside dimensions</td>
<td>770 x 1280 x 1210</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inside capacity (L)</td>
<td>178</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>220</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. PVC-211, 231, 331 — Based on no-load circulation operation at +20°C ambient temperature.
2. PVHC-231MS, 331MS — Based on no-load circulation operation at +20°C ambient temperature, at class 1000 cleanroom.
3. *When the chamber door is open, class 1000 cleanliness cannot be maintained.
4. Temperature constancy and temperature uniformity are in accordance with JIS Z 0110 (Japan Testing Machinery Association).
5. *Excluding protrusions.

### SAFETY DEVICES

- Leakage breaker for power supply
- Circuit breaker for SSR overload shortcircuit protection
- Electrical compartment door switch
- Short circuit protection fuse for control circuit
- Oven heater protector
- Oven door switch
- Thermal fuse

### ACCESSORIES

- Shelves (stainless steel wire) ........................................... 2
- Shelf bracket (stainless steel plate) ................................... 2 sets
- Fuse (glass tube type A 3A) ............................................. 2
- Connectors (for specimen power supply control terminal) .... 1
- Instruction manual (Basic/Reference) ............................. 1 each
- Warranty ........................................................................... 1

**DANGER**
- Do not use specimens which are explosive or inflammable, or which contain such substances. To do so could be hazardous, as this may lead to fire or explosion.

**CAUTION**
- Do not place corrosive materials in the chamber. If corrosive substances or humidifying water is used, the life of the unit may be significantly shortened.
- Be sure to read the instruction manual before operation.
**Modification for Clean-room Compatibility**

Prevention of particle and dust scattering from control console and heater vents.
- Flange diameter: 90mm
- Air discharge system: Forced discharge

*Please be prepared with your own facility for exhaust fan.

**Pre-filter**

Removes large particles from external air. Recommended when installing the oven in a location other than a clean room. (for oven with damper)

**Exhaust Port Flange**

Flange for discharging hot air from the oven. Installed on rear of chamber. (for oven with damper)
- Material: Cold rolled steel plate
- Unichrome plated finish
- Diameter dimension: 90mm
*When connecting to exhaust duct, the length of duct must be less than 4m.

**O₂ Concentration Indication Adjuster**

This controls the oxygen concentration inside the oven.
- Oxygen concentration range: 5%-15% oxygen concentration (v/u)
- Without damper
- Injection gas: N₂ gas (Normal temperature, dry gas)
* Except PVHC-231MS/331MS

**Nitrogen Gas Injector**

Used for reducing specimen oxidation and saving temperature pull-down time.
- Input pressure:
  - 0.05MPa (max flow rate: 30L/ min)
  - 0.10MPa (max flow rate: 100L/ min)
  - 0.20MPa (max flow rate: 200L/ min)
*Photo shows max flow rate 30L/min
- Flow meter: Floating flow meter

**Automatic Damper**

Automatically provides ventilation according to the open/ close pattern determined by programmed operation.
Standard on PVHC-231MS/331MS
- Damper opening and closing range: 0% (fully closed) to 99% (fully opened)
- Minimum graduation: 1%

**Exhaust Duct**

Exhausts hot air toward the ceiling. Installed on rear of chamber. (for oven with damper)
- Diameter dimension: 90mm

**Exhaust Duct and Exhaust Port Flange**

When the exhaust port flange is connected to the exhaust duct.

**External Atmosphere Introducing Blower**

Used to supplement cooling, for ventilation, etc. (for oven with damper)
OPTIONS

**Paperless recorder**
Records temperature inside the chamber. Additional inputs may also be recorded.
- Temperature range: 0 to +200 °C
  0 to +300 °C
  0 to +400 °C
- Number of inputs:
  Temperature 1 (5 more but turned OFF*)
- Data saving cycle: 5 sec
- External recording media: CF memory card (32MB)
- Language: English
  * Settings may be modified.

**Thermocouple**
Measures the temperature of specimens.
- 2m / 4m / 6m

**Time-up Output Signal**
Outputs contact signals at the end of programmed operation.
- Power supply capacity 250V AC 1A
- Contact output at program time-up.
- Installed at rear of chamber.

**Calendar timer**
Automatically sets the chamber on and off every day. Installed on operating panel.
- Setting range:
  Sunday to Saturday (one week)
  0:00am to 11:59am
  0:00pm to 11:59pm
- Margin of error per month 15sec

**Integrating Hour Meter**
Integrates and indicates running hours.
Comes with or without reset, installed on operating panel.
(Does not integrate prior to automatic start or after automatic stop of oven during programmed operation, nor during chamber stop due to failure)
- Measuring time
  9999.9hr
  (without reset, does not return to zero)
  9999.9hr (with reset)
- Rotational indication
  1mpr (without reset)
  2mpr (with reset)

**Mesh Shelf**
For testing small specimens
- Material: 18-8 Cr-Ni stainless steel

**Load Resistant Shelf and shelf Bracket**
Used to test specimens exceeding weight of the maximum allowable for standard shelves.
- Material: 18.8 Cr-Ni stainless steel plate
- Total allowable shelf load Max 200kg

**Shelf and Shelf Bracket**
Equivalent to those supplied as accessories.

---

**Temperature Recorder**
- Temp range
  0 to +200 °C
  0 to +300 °C
  0 to +400 °C
- Recording system
  Pen recorder (1 pen)
  or multi-point recorder (6 dots)
- Recording speed
  30 - 60mm/hr
  (two-speed switching)

**Temperature Detection Terminal**
Outputs chamber temperature through thermocouple type K.
**OPTIONS**

**Stand**

- Exterior
  Cold rolled and rust-proof steel plate with melamine baked finish.

*For PV(H)C-211*

<table>
<thead>
<tr>
<th>Model</th>
<th>Outside dimension Width x Depth x Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>MVC-23</td>
<td>770 x 300 x 960</td>
</tr>
<tr>
<td>MVC-23C</td>
<td>770 x 321 x 960</td>
</tr>
<tr>
<td>MVC-26</td>
<td>770 x 600 x 960</td>
</tr>
<tr>
<td>MVC-28C</td>
<td>770 x 621 x 960</td>
</tr>
</tbody>
</table>

*MCV-23C/28C are equipped with casters with adjustable Free wheel (4 casters).*

**External Alarm Terminal**

Outputs alarm signals. Installed on rear of chamber.
- Output point 1 point
- Power supply capacity 250V AC 1A
- Contact output at close in an emergency.
- Installed at rear of chamber.

**Emergency Stop Switch**

Operation is shut down in case of emergency.

**Caster**

Installed on main unit stand.
- With level adjuster
  - Free wheel (4 casters)

**E-BUS Cable**

5m/10m

**Power Cord**

If the standard 2m is not long enough, 5m and 10m cords are available.

*Some photographs listed in this catalog contain Japanese display.*