Vacuum Oven
VAC
Vacuum ovens featuring six operation modes to handle a wide range of applications

This vacuum ovens have been developed with refined functions to offer greater ease of use and enhanced production-line features, offering six operation modes to suit a range of applications, including Expert Mode, which effectively adjusts the depressurization rate during high-volume processing of identical specimens, and up to nine step programming.

Such as a double-layered interior construction to provide excellent temperature uniformity and an overall design emphasis on ease-of-operation and safety, vacuum ovens have appropriate features as production-line ovens.
VAC-300PR

*Pirani vacuum gauge and temperature and pressure recorder are optional.
Can control depressurization rate adjusting to specimens

- **Expert Mode demonstrates its capabilities in repeated high-volume processing**
  
  A jog dial is provided for fine control of the depressurization rate. The depressurization schedule used is stored and can be called up for subsequent operations to ensure accurate processing. Expert Mode eliminates the fussing with valve controls for each process, and is ideally suited for repeated high-volume processing of identical specimens.

- **Torr-Pa automatic selection function**
  
  Display readings are given in Pa in accordance with the shift toward SI pressure units. Torr-Pa automatic selection function is equipped as a standard; however, the display panel can be switched to the previously used Torr units by touching the button on the panel.

- **Viewing window for full view of specimen**
  
  The viewing window is curved very slightly to eliminate exterior reflections. In Expert Mode, the jog dial can be used to adjust the depressurization rate accordingly while checking the defoaming of the resin inside the oven, preventing problems in the specimen caused by rapid pressure changes.
Vacuum control modes to suit a wide range of applications

**Six operation modes to be chosen**

The ovens feature a selection of six operating modes, including constant operation, allowing timer-controlled start and stop (on/off); programs 1 and 2, allowing programmed operation of up to nine steps; gas exchange mode; vacuum gradient control mode; and expert mode, allowing repeated high-volume processing of identical specimens. These modes eliminate troublesome operations and use program controls to meet operations to particular applications.

### Six operation modes

<table>
<thead>
<tr>
<th>Program</th>
<th>Typical pattern</th>
<th>Details</th>
<th>Main applications</th>
</tr>
</thead>
</table>
| Constant value           | ![Constant Value Graph](image) | - Sets the constant operation temperature and pressure.  
- Timer-controlled setting "on/off" is also possible. | Vacuum drying              |
| Program 1, Program 2    | ![Program 1, Program 2 Graph](image) | - Two temperature and pressure program patterns can be set in up to nine steps.  
- Pressure decrease and increase time cannot be controlled (ramp operation). | Vacuum hardening           |
| Gas exchange             | ![Gas Exchange Graph](image) | - Gas exchange is performed three times in step one. Temperature cannot be controlled, however.  
- Temperature and pressure can be programmed and controlled from step 2 to step 9. | Drying in N₂ gas           |
| Vacuum gradient control  | ![Vacuum Gradient Graph](image) | - The pressure decrease and increase times can be controlled (ramp operation).  
- Temperature can be programmed and controlled in up to step 9. | Defoaming vacuum drying    |
| Expert                   | ![Expert Graph](image) | - The jog dial can be used to control, record, and reproduce depressurization.  
- The depressurization process can be recorded in step 1 only (Pressure increase cannot be controlled).  
- Temperature and pressure can be programmed and controlled in up to step 9. | Defoaming                  |
Excellent temperature uniformity and ease of operation

- **Double-layered interior construction for great temperature uniformity**
  The vacuum chamber interior features a second chamber, forming a double-layered construction. A heater is installed on the exterior of the inner chamber to minimize heat loss and to improve temperature uniformity (–4°C for VAC-300PR). This allows even more uniform heat treatment, and also improves machine efficiency by dramatically reducing the time required to heat up.

- **Design emphasizing ease of use**
  A space at least 110 mm high is provided underneath the stand to allow easy loading and unloading of specimens using a hand lift during high-volume processing. The design also includes ease-of-use features, such as door handles with a recoil-free locking mechanism for smooth opening and closing.

- **Equipment range to suit production scale**
  Ovens are available in three types, with internal dimensions of 45cm × 45cm, 60cm × 60cm, and 80cm × 80cm. Rotary vacuum pumps are used.

- **Suitable for a wide range of usages**
  The ovens are ideal for wide range of applications, particularly in electronic component production processes, including defoaming when mixing silicone rubber or resins in LED production, deaerating during various types of resin forming, hardening when injecting epoxy for hybrid ICs, and drying electronic components after washing.
Special safety features
A protective cover is provided on the front of the viewing window to prevent burn injuries and also to prevent damage to the window. Moreover the double-layered interior construction, which ensures that exterior surfaces remain cool.

Supports a centralized control system for environmental testing (CMS-J30 sold separately)
This is a fully customizable system that provides centralized control, centralized monitoring, remote operation and specimen data management of ESPEC products (up to 32 units of which 16 are dedicated to centralized monitoring) by the use of a PC. Windows® 2000 software provides easy-to-use data processing functions, such as program editing.

Environmental testing centralized control software ERC-100M/300M (sold separately)
The application software allows centralized monitoring, control, and remote operation of up to 16 ESPEC chambers. (monitoring only for 300M) You can drastically save time while your PC collects data for analysis and graphing.

*Monitoring only for vacuum oven.
*Software: English, Chinese (in simplified characters), Japanese (English and Japanese only for ERC-300M)
*For further inquiries, please contact your nearest ESPEC office.
### SPECIFICATIONS

<table>
<thead>
<tr>
<th>Model</th>
<th>VAC-100PR</th>
<th>VAC-200PR</th>
<th>VAC-300PR</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Power supply</strong></td>
<td>200V AC 1 2W 50/60Hz</td>
<td>200V AC 3 3W 50/60Hz</td>
<td>200V AC 3 3W 50/60Hz</td>
</tr>
<tr>
<td></td>
<td>200V AC 3 3W 60Hz</td>
<td>220V AC 1 2W 60Hz</td>
<td></td>
</tr>
<tr>
<td></td>
<td>230V AC 1 2W 50/60Hz</td>
<td>240V AC 1 2W 50/60Hz</td>
<td></td>
</tr>
<tr>
<td><strong>Maximum power consumption</strong></td>
<td>2.75kVA</td>
<td>3.65kVA</td>
<td>2.75kVA</td>
</tr>
<tr>
<td><strong>Pressure control system</strong></td>
<td>Fuzzy control</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Operating temperature</strong></td>
<td>+5 to +35°C ( +41 to +95°F)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Temperature control range</strong></td>
<td>+40 to + 200°C ( +104 to +392°F)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Temperature fluctuations</strong></td>
<td>0.5°C (vacuum), 1°C (atmospheric)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Temperature heat-up rate</strong></td>
<td>Within 50 min</td>
<td>Within 70 min</td>
<td>Within 80 min</td>
</tr>
<tr>
<td><strong>Pressure control range</strong></td>
<td>933 to 1 [10^-6 Pa]</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Attainment pressure</strong></td>
<td>Below 133 Pa</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Pressure pull-down rate</strong></td>
<td>Within 7 min</td>
<td>From atmospheric pressure to 133 Pa</td>
<td>Within 15 min</td>
</tr>
<tr>
<td><strong>Pressure recovery time</strong></td>
<td>Within 4 min</td>
<td>Inlet open to atmosphere</td>
<td>Within 8 min</td>
</tr>
<tr>
<td><strong>Construction</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exterior material</td>
<td>Enameled cold-rolled steel plate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vacuum chamber</td>
<td>Stainless steel plate (SUS304)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interior material</td>
<td>Stainless steel plate (NSS430M3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Viewing window</td>
<td>W324 x H336 mm</td>
<td>W13 x H13.4 inch</td>
<td></td>
</tr>
<tr>
<td><strong>Insulation</strong></td>
<td>Glass wool</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Heater</strong></td>
<td>Mica heater</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Inlet</strong></td>
<td>R 1/4 inch, max. operating pressure 0.05 MPa (0.5 kg/cm²)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Outlet</strong></td>
<td>28 mm internal dia. rubber hose connection</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Oil rotary vacuum pump</strong></td>
<td>200V AC 1 50/60Hz 550W</td>
<td>200V AC 3 50/60Hz 550W</td>
<td></td>
</tr>
<tr>
<td><strong>Design exhaust speed</strong></td>
<td>200L/min (50Hz), 240L/min (60Hz)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Effective exhaust pressure</strong></td>
<td>6.7 x 10^-2 Pa</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Auxiliary functions</strong></td>
<td>Gas ballast valve, oil mist trap</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Fittings</strong></td>
<td>Adjuster feet and casters (free moving) (4 each)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Effective inside capacity (L)</strong></td>
<td>91</td>
<td>216</td>
<td>512</td>
</tr>
<tr>
<td><strong>Effective inside dimensions</strong></td>
<td>W450 x D450 x H450 mm (W18 x D14 x H18 inch)</td>
<td>W600 x D600 x H600 mm (W24 x D24 x H24 inch)</td>
<td>W800 x D800 x H800 mm (W32 x D32 x H32 inch)</td>
</tr>
<tr>
<td><strong>Outside dimensions</strong></td>
<td>W870 x D1450 x H962 mm (W34.8 x D57.1 x H37.8 inch)</td>
<td>W1020 x D600 x H812 mm (W40.8 x D23.6 x H32.5 inch)</td>
<td>W1220 x D800 x H1012 mm (W48.8 x D31.5 x H40.5 inch)</td>
</tr>
<tr>
<td><strong>Weight (kg)</strong></td>
<td>320 (320 for 220, 230, 240V)</td>
<td>400 (408 for 220, 230, 240V)</td>
<td>610</td>
</tr>
</tbody>
</table>

*1: Voltage fluctuations within ±10% of rated voltage.

*2: Time to attain stable temperature the center of chamber with no specimen, under vacuum with ambient temperature of +23°C and temperature setting of +200°C.

*3: Constant temperature inside chamber with no gas generation from specimen.

*4: Excluding protrusions.
**SAFETY DEVICES**

- Leakage breaker
- Overheat protector
- Thermal fuse
- Thermal relay

**ACCESSORIES**

- Shelves
  - Stainless steel punched trays .......................................................... 2
  - VAC-100 PR: W435 × H13.5 × D435 (mm)
    - Maximum load: 30kg per shelf (evenly-distributed load)
  - VAC-200 PR: W585 × H13.5 × D585 (mm)
    - Maximum load: 30kg per shelf (evenly-distributed load)
  - VAC-300 PR: W785 × H13.5 × D785 (mm)
    - Maximum load: 20kg per shelf (evenly-distributed load)

*Two shelves are included as standard, and up to five can be fitted.
Total specimen weight must not exceed 100kg.

- User’s manual .............................................................. 1
- Vacuum pump instruction manual ................................. 1
- Warranty .............................................................. 1

**TEMP & PRESSURE INDICATOR-CONTEOLLER**

<table>
<thead>
<tr>
<th>Operation mode</th>
<th>Setting range</th>
<th>Setting and indication resolution</th>
<th>Alarm functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant value</td>
<td>Constant temperature/pressure operation</td>
<td>Temperature: 0 to +200°C</td>
<td>Upper and lower temperature and pressure limit alarm</td>
</tr>
<tr>
<td>Programs 1, 2</td>
<td>Auto start/stop possible</td>
<td>Pressure: 0 to 1013 × 102 Pa</td>
<td>Temperature and pressure sensor disconnection alarm</td>
</tr>
<tr>
<td>Gas exchange</td>
<td>Auto gas exchange in up to nine steps</td>
<td>Time: 1 minute to 99 hours 59 minutes</td>
<td>Overheat protector operation alarm</td>
</tr>
<tr>
<td>Vacuum</td>
<td>Program operation after step 1</td>
<td>Pressure: 1 × 10^9 Pa</td>
<td>Thermal fuse disconnection alarm</td>
</tr>
<tr>
<td>gradient control</td>
<td>Auto start possible</td>
<td>Time: 1 minute</td>
<td>CPU memory error alarm</td>
</tr>
<tr>
<td>Expert</td>
<td>Program operation after step 2</td>
<td></td>
<td>Motor valve malfunction alarm</td>
</tr>
<tr>
<td></td>
<td>Up to nine steps, auto start possible</td>
<td></td>
<td>Vacuum pump thermal relay operation alarm</td>
</tr>
</tbody>
</table>

**Safety Note:**

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

- Read the User’s manual thoroughly prior to use to ensure correct operation of the vacuum pump.
### OPTIONS

#### Hermetic terminals for voltage application
Used when applying to specimens voltage.
- Specifications: Hermetic terminal (four-core)
  - Max. current: 6 A
  - Max. voltage: 200V AC, 250V DC
  - Mounted location: Oven rear
* Up to four hermetic connectors can be connected to terminals for voltage application and thermocouples.

#### Hermetic terminals for thermocouples
Used for connecting to thermocouples from specimens or interior chamber.
- Specifications: Hermetic terminal (eight-core, four pairs)
- Mounted location: Oven rear
* Up to four hermetic connectors can be connected to terminals for thermo-couples and voltage application.

#### Terminal for recorder
Output interior temperature and pressure via 1 to 5V DC linear output.
- Temperature: + 20°C to + 220°C, 1V to 5V
- Pressure: 0 to 106.7 kPa, 1V to 5V
- Mounted location: Oven rear (above inlet)

#### Pirani vacuum gauge
Pressure is displayed digitally, while this gauge is used to measure pressure accurately below 2,700 Pa.
- Measuring range: 0.4 to 2,700 Pa
- Measuring accuracy: within ±3% of full-scale 100% equivalent on linear scale
* The temperature and pressure recorder cannot be fitted to the VAC-100PR if the Pirani vacuum gauge is installed.

#### Integrating hour meter
Indicates the total integrated operating time.
This is used as a guide for time recording during continuous operation, as well as for maintenance and inspection timing.
- Mounting location: Bottom of operating panel

#### Paperless recorder
Records temperature and pressure inside the chamber. Additional inputs may also be recorded.
- Temperature range: + 20°C to + 220°C
- Pressure range: 0 to 106.7 kPa
- Number of inputs: Temperature 1, Pressure 1
- Data saving cycle: 5 sec
- External recording media: CF memory card (32MB)
*1 Settings may be modified.
* The Pirani vacuum gauge cannot be fitted to the VAC-100PR if the paperless recorder is installed.

#### Temperature and pressure recorder
Records the interior oven temperature and pressure.
- Temperature range: + 20°C to + 220°C
- Pressure range: 0 to 106.7 kPa
- Inputs: Temperature (1), Pressure (1)
- Recording method: Intermittent recording
* The Pirani vacuum gauge cannot be fitted to the VAC-100PR if the temperature and pressure recorder is installed.
### OPTIONS

**External alarm terminal**

If the safety device of the chamber activates, an error is notified to a distance via the external alarm terminal.
- Power capacity: 250V AC, 3A
- Operation: Connection output when error occurs (closed)
- Mounted location: Oven rear (above inlet)

**Signal tower**

Illuminates to indicate errors when the safety device activates.
- Color: Red
- Mounting location: Top panel

**Inlet filter**

Filters the air drawn into the depressurized interior.
- Pore size: 0.2 m
- Max. pressure: 411.9 kPa (4.2 kg/cm²)
- Connector: NPT 1/8, male screw
- Mounting location: Inlet

**Cold trap**

Cools and removes moisture and organic solvents contained in the outlet air before being drawn into the vacuum pump.
(Separate from oven)
- Outside dimensions: W306 ⨯ H700 ⨯ D355mm

**Vacuum pump outlet port**

Vents gas from the vacuum pump externally.
- Outside connector: NW25 (ISO standard)
- Connection: Quick coupling Center ring with O-ring (not provided)
- Mounting location: Shelf rear

**Shelves**

Stainless steel punched trays
* Up to five can be fitted inside the oven.

**Vacuum pump oil (one-liter can)**

Used when maintaining the vacuum pump.

**Power cord**

Length from oven: 5 and 10m (two extra cords provided)
* The standard cord provided is 2.5 m from the oven.

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Some photographs listed in this catalog contain Japanese display.
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Quality Management System Assessed and Registered

ISO 14001 (JIS Q 14001)
Environmental Management System Assessed and Registered
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