ESPEC

Vacuum Oven

VAC・LCV

CAT.NO.E04196-Z702

Vacuum ovens and vacuum driers that serve a wide array of uses

ESPEC vacuum ovens are
designed with easy operation on production lines in mind.
They provide a variety of features such as six application-specific operation modes including an Expert Mode that effectively adjusts the depressurization rate during high-volume processing of identical specimens,
and a Program Mode that can remember up to nine steps.
Direct-heated vacuum driers speedily perform tasks that use nitrogen such as anaerobic baking, defoaming, hardening and deaerating.

VAC-100PR

VAC-200PR

*Pirani vacuum gauge and temperature and pressure recorder are optional.

VAC-300PR

LCV-233P

Can control depressurization rate adjusting to specimens

Jog dial for fine depressurization control

Pa readout

Torr readout

Curved viewing window

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 pro-cessing. 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

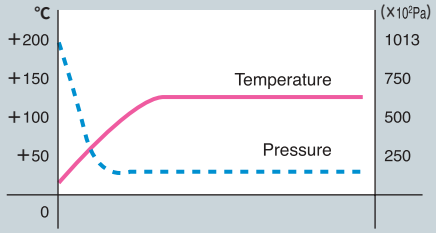
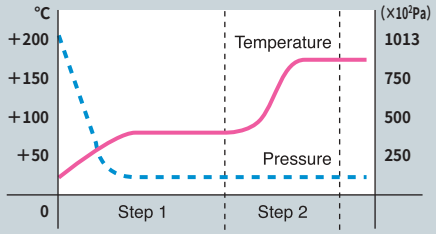
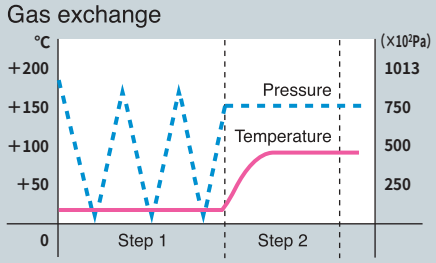
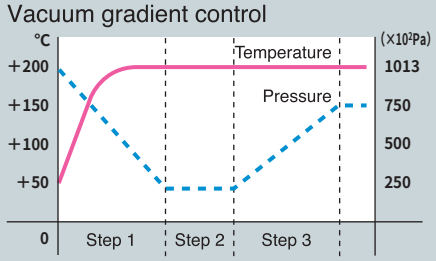
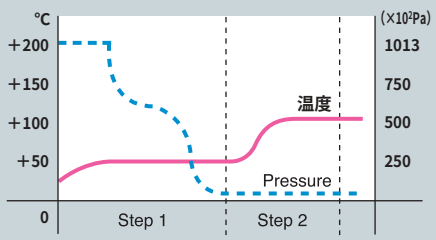
Six operation modes to be chosen

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.

TEMP. & PRESSURE INDICATOR CONTEOLLER

Operation mode	Constant value, Programs 1, 2, Gas exchange, Vacuum gradient control, Expert
Setting range	Temperature: 0 to +200℃ Pressure: 0 to 1013×10² Pa Time: 1 min. to 99 hours 59 min.
Setting and indication resolution	Temperature: 1℃ Pressure: 1×10² Pa Time: 1 minute
Communications function	E-BUS
Alarm functions	Upper and lower temp. and pressure limit alarm Temp. and pressure sensor disconnection alarm Overheat protector operation alarm Thermal fuse disconnection alarm CPU memory error alarm Motor valve malfunction alarm Vacuum pump thermal relay operation alarm

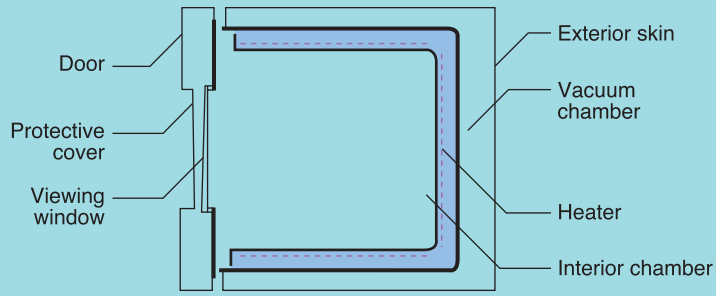
Six operation modes

Program and Typical pattern	Details	Main applications
Constant value 	• Sets the constant operation temp. and pressure. • Timer-controlled setting "on/off" is also possible.	Vacuum drying
Program 1, 2 	• Two temp. 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 is performed three times in step one. Temp. cannot be controlled, however. • Temp. and pressure can be programmed and controlled from step 2 to step 9.	Drying in N_2 gas
Vacuum gradient control 	• The pressure decrease and increase times can be controlled (ramp operation). • Temp. can be programmed and controlled in up to step 9.	Defoaming vacuum drying
Expert 	• 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.) • Temp. and pressure can be programmed and controlled in up to step 9.	Defoaming

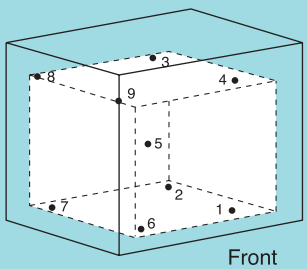
Excellent temperature uniformity and ease of operation

Inside chamber

Double-skin interior construction



Interior chamber temperature uniformity measurement data



Model: VAC-300R
Temperature setting: +200°C
Pressure: 400 Pa vacuum
Ambient temperature: +27°C

*Temperature uniformity for interior center (point 5) and eight interior points with no specimen.

Point	Temp.
1	+181.7
2	+189.1
3	+188.6
4	+185.6
5	+186.6
6	+186.2
7	+190.5
8	+188.6
9	+189.7
Uniformity	±4°C

■The measurements above are typical values, and are presented for reference only.

Double-layered interior construction for great temperature uniformity

The vacuum chamber interior features a second chamber, forming a double-layered construction. A heater is instolled on the exterior of the inner chamber to minimize heat loss and to improve temperature uniformity (±4℃ 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.

SPECIFICATIONS

Model			VAC-100PR	VAC-200PR	VAC-300PR
Power supply *1			200V AC 1φ 2W 50/60Hz, 200V AC 3φ 3W 50/60Hz 220V AC 1φ 2W 60Hz, 230V AC 1φ 2W 50/60Hz 240V AC 1φ 2W 50/60Hz		200V AC 3φ 3W 50/60Hz
Maximum power consumption			2.75kVA	3.65kVA	2.75kVA
Pressure control system			Fuzzy control		
Operating temperature			+5 to +35℃ (+41 to +95°F)		
Temperature control range			+40 to +200℃ (+104 to +392°F)		
Temperature fluctuations			±0.5℃ (vacuum), ±1℃ (atmospheric)		
Temperature heat-up rate *2			Within 50 min.	Within 70 min.	Within 80 min.
Pressure control range			933 to 1 [×10² Pa]		
Attainment pressure *3			Below 133 Pa		
Pressure pull-down rate *3			From atmospheric pressure to 133 Pa Within 7 min.	Within 15 min.	Within 30 min.
Pressure recovery time			Inlet open to atmosphere Within 4 min.	Within 8 min.	Within 15 min.
Construction	Exterior material		Enameled cold-rolled steel plate		
	Vacuum chamber		Stainless steel plate (SUS304)		
	Interior material		Stainless steel plate (NSS430M3)		
	Viewing window		W324×H336 mm (W13.0×H13.4 inch)		
	Insulation		Glass wool		
	Heater		Mica heater		
	Inlet		R 1/4 inch, max. operating pressure 0.05 MPa (0.5 kg/cm²G)		
	Outlet		28 mm external dia. rubber hose connection		
Oil rotary vacuum pump		Motor	200V AC 1φ 50/60Hz 550W		200V AC 3φ 50/60Hz 550W
		Design exhaust speed	200L/min. (50Hz), 240L/min. (60Hz)		
		Attainment pressure	6.7×10⁻² Pa		
		Auxiliary functions	Gas ballast valve, oil mist trap		
Fittings			Adjuster feet and casters (free moving) (×4 each)		
Effective inside capacity (L)			91	216	512
Effective inside dimensions			W450×H450×D450 mm (W18.0×H18.0×D18.0 inch)	W600×H600×D600 mm (W24.0×H24.0×D24.0 inch)	W800×H800×D800 mm (W32.0×H32.0×D32.0 inch)
Outside dimensions *4			W870×H1450×D662 mm (W34.8×H58.0×D26.5 inch)	W1020×H1600×D812 mm (W40.8×H64.0×D32.5 inch)	W1220×H1800×D1012 mm (W48.8×H72.0×D40.5 inch)
Weight (kg)			320 (328 for 220, 230, 240V)	400 (408 for 220, 230, 240V)	610

*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.

DANGER 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.

CAUTION Read the User's manual thoroughly prior to use to ensure correct operation of the vacuum pump.

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

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 thermo-couples.

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.


for voltage application


for thermocouples

Terminal for recorder

Output interior temperature and pressure via 1 to 5V DC linear output.
Temperature: +20℃ to +220℃, 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 or the paperless recorder cannot be fitted to the VAC-100PR if the Pirani vacuum gauge is installed.

Paperless recorder

Records temperature and pressure inside the chamber. Additional inputs may also be recorded.
Temperature range: +20 to +220℃
Pressure range: 0 to 106.8kPa
Number of inputs (Initial setting):
Temperature 1
Presure 1
(4 more channels can be turned ON)
Data saving cycle: 5 sec
External recording media:
CF memory card (32MB)
Language Support: ENG, JPN

* 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 to +220℃
- 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

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

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 µm
- Max. pressure: 411.9 kPa (4.2 kg/cm^2)
- 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

Vacuum pump oil (one-liter can)

Used when maintaining the vacuum pump.

Shelves

Stainless steel punched trays

* Up to five can be fitted inside the oven.

E-BUS cable

- 5, 10m

Power cord

Length from oven: 5 and 10m
(two extra cords provided)

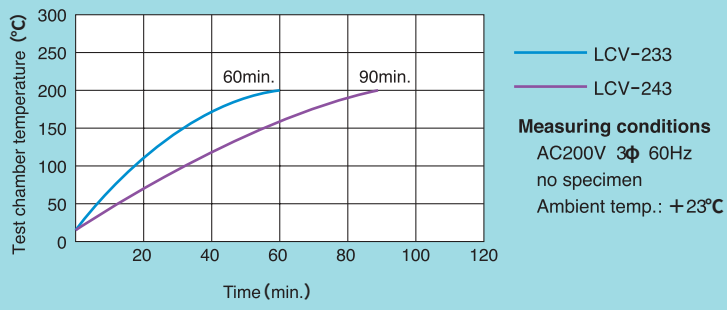
* The standard cord provided is 2.5 m from the oven.

■Some photographs listed in this catalog contain Japanese display.

LCV

Vacuum Oven LCV

Temperature heat-up rate (Example)



* Measurement results above are shown as an example.

Direct heating system for fast vacuum-dry.

In addition to the gas exchange function, it can treat specimens in oxygen-free atmospheres using nitrogen or other gases, and supports baking, degassing, hardening, deaeration and numerous other applications.

Easy operation

Temperature setting and upper/lower temperature limit alarm setting can be done with simple key operation.

TEMP. PROGRAM INDICATOR CONTROLLER

Operation mode	Program operation, Constant operation
Program capacity	9 steps / 1 pattern (Number of repetition: 1 to 99)
Setting and indication ranges	Temperature : 0 to +215℃ Time : 0 to 99hours 59min., 100 to 999hours
Setting and indication resolution	Temperature : 1℃ Time : 1min.
Input	Thermocouple type K (Nickel-Chromium/ Nickel-Aluminum)
Control	PID control
Auxiliary functions	Input burn-out detection function Upper and lower temp. limit alarm function Self-diagnostic function (Watchdog timer) Alarm indication function Power failure protection function Timer function (automatic start/ stop)

SPECIFICATIONS

Model		LCV-233	LCV-243
System		Direct PID control	
Vacuum control		Manual LEAK-VACUUM balance system	
Power supply		AC200V 3φ 50/60Hz	
Maximum current		8A	9A
Performance *1	Temperature range	(Ambient+20)℃ to +200℃ (±392°F)	
	Pressure range	0 to −101kPa (Gauge)	
	Temperature fluctuation	±1.0℃ (±1.8°F)	
	Temperature heat-up rate	Ambient temperature to +200℃ (+392°F)	
		70 min.	110 min.
Construction	External material	Painted steel (melamine coating)	
	Internal material	18-8 Cr-Ni stainless steel plate (2B polish)	
	Viewing window	Tempered glass	
	Vacuum gauge	Bourdon tube vacuum gauge	
Heater		Mica heater	
Capacity		90L	165L
Inside dimensions *2		W450×H450×D450 mm (W17.7×H17.7×D17.7 in.)	W550×H550×D550 mm (W21.7×H21.7×D21.7 in.)
Outside dimensions *2		W670×H890×D700 mm (W26.4×H35.0×D27.6 in.)	W770×H990×D800 mm (W30.3×H39.0×D31.5 in.)
Weight		170kg	250kg

*1 Figures for an ambient temperature of +23℃ with no specimen in the chamber.
The performance is according to JTM K 05-2000 of Japan Testing Machinery Association.

*2 Excluding protrusions

■ A separate type transformer for voltage modification is available upon request.

Vacuum Oven with vacuum pump
(Specfication for Vacuum Oven is the same as stated above.)

Model	LCV-233P	LCV-243P
Vacuum pump performance *	Direct coupled oil−rotating vacuum pump 6.7×10^{-2} Pa (abs) with gas ballast valve closed 0.67Pa (abs) with gas ballast valve open	
Power supply	AC200V 3φ 50/60Hz	
Discharge speed *	253/ 309L/ min.	
Outside dimensions *2	W670×H1540×D700 mm (W26.4×H60.6×D27.6 in.)	W770×H1640×D800 mm (W30.3×H64.6×D31.5 in.)
Weight	240kg	320kg

* Individual performance rate of vacuum pump.

SAFETY DEVICES

- Leakage breaker for power supply
- Thermal fuse
- Watchdog timer
- Overheat protector (independent type)
- Upper and lower temperature limit alarms
- Sensor burn-out detection circuit

ACCESSORIES

- Shel/ Shelf bracket (Stainless steel plate) ..... 5 sets
- User's manual ..... 1 set

OPTIONS

Hermetic terminal

The terminals are used to apply voltage to specimen inside chamber and to measure in-chamber temperatures.

- for thermocouple 8P(×4 pairs)
- for voltage impression 4P

Reverse flow prevention valve

The valve prevents lubricating oil inside vacuum pump from reverse flow when chamber is vacuum state.

* LCV-233P, 243P models only.

Shelf, Shelf bracket

Standard specification shelves and shelf brackets are added as required.

Chamber stand

The stand is equipped with casters enabling chamber to move.

* LCV-233, 243 models only.
* Standard equippment in LCV-233P, 243P models.

Communication function

Connects chamber to a PC, enabling operation control of the chamber.

- RS-485
- GPIB
- RS-232C
- E-BUS

Communication cable

- RS-485 cable (5, 10 m)
- GPIB cable (2, 4 m)
- RS-232C cable (1.5, 3, 5 m)
- E-BUS cable (5, 10 m)

Special spare parts

In addition to standard parts, control parts are installed on request.

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JSAQ 004

QMS Accreditation
R001

EMS Accreditation
RE 009

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ISO 9001/JIS Q 9001
Quality Management System Assessed and Registered

ESPEC CORP. has been assessed by and registered in the Quality Management System based on the International Standard ISO 9001:2000 (JIS Q 9001:2000) through the Japanese Standards Association (JSA).

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

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