

3. Theory of Operation

3.1. The Stackable LCC/LCD Series Oven

The Stackable LCC/LCD Series Oven (Figure 1) offers HEPA (High Efficiency Particulate Air) filtration for processes where minimized contamination is essential. The removable HEPA filter is designed to provide a constant flow of 99.97% clean air to the product being heated. The HEPA filter with silicone seal provides 99.99% filtration.

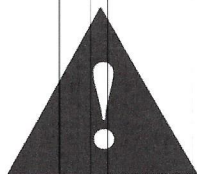
The oven operator interface is located on the hinged control panel at the front of the oven (Figure 1). Power components are located on the equipment panel, behind the hinged control panel, for easy access (Figure 8). Electrical components are either touch-proof or are shielded with Lexan⁷ material to prevent accidental exposure during maintenance and troubleshooting.

The cooling fan is controlled on/off by an event relay in the Protocol Plus Control. The cooling fan is used for rapid cool-down at the end of the process cycle, or to maintain low temperature setpoints during process cycle. It may also be turned on at the start of a process cycle to assure that starting temperature is less than 70°C.

The nitrogen models have stainless steel water coil which permits rapid cool down and lower temperature operation. The nitrogen oven comes with an adjustable flowmeter for adjusting purge rate, and needle valve for setting maintain rate, separate solenoid valves for purge and maintain operation and a pressure relief exhaust port. An exhaust fan which powers on whenever the oven is running maintains consistent chamber pressure control with varied exhaust stack conditions.



Figure 1. Stackable LCC/LCD Series Oven.



Danger!

Use care when working with nitrogen. Nitrogen presents an asphyxiation hazard. Handle nitrogen according the safe handling procedures listed in the material safety data sheet.

⁷ Trademark of SABIC Innovative Plastics.

1.5. Specifications

1.5.1. Model Numbering and Naming Conventions

Table 1 lists the model numbers and follows these conventions:

Model Number	L			1	-					-	3
Position in Number	1	2	3	4		5	6	7	8		

Table 1. Model Number Key.

Position in Model Number	Letter / Number	Letter Meaning
2	C	Model has a HEPA filter
2	L	Model does not have a HEPA filter
3	C	Model operates at 260°C
3	D	Model operates at 350°C
5 & 6	16	1.6 cubic foot model
5 & 6	51	5.1 cubic foot model
7 & 8	N	Model uses a nitrogen atmosphere
7 & 8	V	Model uses Viton [*] synthetic rubber (Silicone-free option)

Example: **LLD1-51NV-3**

This 5.1 ft³ model does not have a HEPA filter, operates at 350°C, uses nitrogen and is silicone-free.

1.5.2. Dimensions

Models	Chamber Size inches (cm)			Capacity ft ³ (liters)	Overall Size inches (cm)			Maximum number of Shelves
	W	D	H		W	D	H	
LCC1-16-3 LCD1-16-3 LCC1-16N-3 LCD1-16N-3	15 (38)	14 (36)	14 (36)	1.6 (45)	32.5 (83)	35.5 (90)	20.75 (53)	5
LCC1-51-3 LCD1-51-3 LCC1-51N-3 LCD1-51N-3	23 (58)	20 (51)	20 (51)	5.1 (144)	40.5 (103)	42.5 (108)	27 (69)	8

*LLC & LLD models have same dimensions.



The LCC/LCD oven is not intended to process solvents or other volatile or flammable materials. Oven exhaust is intended for cooling purposes only.

* Trademark of E. I. Du Pont De Nemours & Company Corporation.

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1.5.3. Capacities

Model	LCC1-16-3 & LCD1-16-3 LCC1-16N-3 & LCD1-16N-3	LCC1-51-3 & LCD1-51-3 LCC1-51N-3 & LCD1-51N-3
Maximum Load (Lbs)	200	200
Maximum shelf load (Lbs)	50	25
Recirculating fan (CFM) (H.P.)	240 1/4	435 1/4
Net weight (Approximate) (Lbs) (KG)	250 114	380 172
Shipping weight (Approximate) (Lbs) (KG)	350 159	525 238
Exhaust capacity (forced exhaust) (CFM)	35	73
Exhaust Outlet (Inch) (mm)	1.88 x 2.88 (48.0 x 73.4)	1.88 x 2.88 (48.0 x 73.4)

1.5.4. Power

If the line voltage for your LCC/LCD Oven varies more than 10% from the oven voltage rating, electrical components such as relays and temperature controls may operate erratically.

- If the line voltage is lower than the oven voltage rating, heat-up time may be significantly longer and motors may overload or run hot
- If the line voltage is higher than the nameplate rating, motors may run hot and draw excessive amperage

Model	Volts *	Amps	Hertz	Heater Phase	KW	Cord and Plug
LCC1-16-3 LCD1-16-3	240	14.8	50/60	1	3	None, hardwired
LCC1-16N-3 LCD1-16N-3	240	14.0	50/60	1	3	None, hardwired
LCC1-51-3 LCD1-51-3	240	27.7	50/60	1	6	None, hardwired
LCC1-51N-3 LCD1-51N-3	240	27.7	50/60	1	6	None, hardwired

*The LCC/LCD Oven is designed for 240 volts (see oven nameplate) will operate satisfactorily on a minimum of 208 Volts, but will result in 25% reduced heater output. If your power characteristic is lower, contact Despatch Industries.

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1.5.5. Temperature

Model		LCC1-16-3 LCD1-16-3	LCC1-16N-3 LCD1-16N-3	LCC1-51-3 LCD1-51-3	LCC1-51N-3 LCD1-51N-3
Time to Temperature (approximate minutes) (no load)	40°C – 100°C	7 min.	7 min.	5 min.	5 min.
	40°C – 200°C	30 min.	30 min.	27 min.	27 min.
	40°C – 260°C	45 min.	45 min.	35 min.	35 min.
	40°C – 350°C†	60 min.	60 min.	50 min.	50 min.
Cooling Time to Temp Minutes (No Load)‡	100°C – 55°C	35 min.	30§ min.	40 min.	25§ min.
	200°C – 55°C	65 min.	55§ min.	75 min.	40§ min.
	260°C – 55°C	75 min.	60§ min.	85 min.	45§ min.
	350°C – 55°C†	130 min.	80§ min.	115 min.	50§ min.
Temperature Uniformity at**	100°C	±1°C	±1°C	±1°C	±1°C
	200°C	±2°C	±2°C	±2°C	±2°C
	260°C	±3°C	±3°C	±3°C	±3°C
	350°C	±4°C	±4°C	±4°C	±4°C
Maximum Operating Temperature	LCC	260°C	260°C	260°C	260°C
	LCD	350°C	350°C	350°C	350°C
Operating Range w/20°C Ambient	LCC	40°C-260°C	35°C-260°C††	45°C- 260°C	35°C-260°C††
	LCD	40°C-350°C	40°C-350°C††	40°C-350°C	40°C-350°C††
Control Stability		+/- 0.5°C	+/- 0.5°C	+/- 0.5°C	+/- 0.5°C

† For LCD & LLD only, LCC & LLC maximum temperature: 260°C.

‡ Minimum operating temperatures and cooling times are based on a 20°C ambient temperature measured at the fresh air inlet.

§ Based on cooling water supplied at 2 GPM (7.6 LPM), 16°C for nitrogen atmosphere units.

** Uniformity figures are based on a nine-point test conducted in an empty oven with thermocouples connected at 3 inches (7.6 cm) from walls after the oven temperature has reached stabilization. Uniformity can vary slightly depending on unit and operating conditions. Class 100 HEPA filtration will limit ramp rates.

†† Requires water cooling be activated for minimum temp rating and operation below 85°C.

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For the LCC1-51 oven model, only two ovens may be stacked vertically.

- Supporting surface must be capable of holding three ovens (750 Lbs or 340.2 Kg) or the weight of two LCC1-51 oven models.
- Use the holes in the rear oven feet to bolt the ovens together by removing the hole plugs in the top of the mating oven beneath.

4.2.2. Oven Utility Connections

Utility connections vary slightly on different LCC/LCD models. Table 3 lists the connection purposes and parameters. Refer to Figure 6 for visual reference.

Table 3. Oven Utility Connections.

Connection (Figure 6)	LCC/LCD Air Atmosphere with optional Water-Cooled Models	LCC/LCD Nitrogen Atmosphere Models with standard water-cooling
NITROGEN INLET	<ul style="list-style-type: none">• Clean Dry Air Inlet (70-80 psi (4.83-5.52 bar))• Purge water from coil prior to heating oven• 1/4" NPT female brass connections provided	<ul style="list-style-type: none">• Nitrogen Inlet (70-80 psi (4.83-5.52 bar))• Purge nitrogen, clean dry air and water from coil prior to heating the oven• 1/4" NPT female brass connections provided.
WATER OUTLET	<ul style="list-style-type: none">• During cooling cycle, water flows through the water coil and out this connection• 3/8" NPT female brass connections provided• Piping must be rated for up to 250 °F (121°C)	
WATER DRAIN	<ul style="list-style-type: none">• At the end of a cooling cycle, Nitrogen or Clean Dry Air is purged through the water coil. Water and pressurized nitrogen/air exit this connection for 30 seconds. Must be connected to gravity style drain (no backpressure).• 3/8" NPT female brass connections are provided.• Piping must be rated for up to 250 °F (121 °C)	
WATER INLET	<ul style="list-style-type: none">• Water Inlet for cooling• 3/8" NPT female brass connections provided• Requires 2 GPM flow at 61 °F (16°C) to meet published cooling rates.• Maximum Pressure 100 PSI (6.89 Bar)	<ul style="list-style-type: none">• Water Inlet for cooling• 3/8" NPT female brass connections provided• Requires 3 GPM flow at 61 °F (16°C) to meet published cooling rates.• Maximum Pressure 100 PSI (6.89 Bar)