Section 4

SPECIFICATIONS

LCI Furnaces
DIVISION OF LOCHABER CORNWALL INC
CONTINUOUS BELT IR FURNACE

EQUIPMENT SPECIFICATIONS

DOC NBR: STD - 802-101401 R2
MODEL: LA-309XN
CUSTOMER:
SERIAL NBR: ALL
SHT 1 OF 1
PRNT 04/11/13

Equipment Model

Model	Base Equipment	Control Zones	Furnace Heated Length	Nominal Furnace Belt Width
LA-309XN	Continuous Belt Controlled Atmosphere Furnace	4	30 in 762 mm	9.5 in 241 mm

Equipment Arrangement

Phase	Process	Max	Length	Process Gas	Temperature (typ)
Phase 1	IR Furnace, 4 Zones	1000 °C	30 in 762 mm	N2	450-950 C
Phase 2	Transition Tunnel		15 in 381 mm	N2	450-750 C
	Gas Convective Cooling, Exterior Fan Heat Removal		30 in 762 mm	N2	35-450 C

Process Sections

Function	Name	Location	Length	Process Gas	Temperature (typ)
Product Load	Load Table Extension	Entrance load area	15 in 381 mm	none	ambient
	Load Station	Entrance load area	15 in 381 mm	none	ambient
IR Furnace	Entr Baffle/Entrance Eductor	Entrance barrier	15 in 381 mm	N2	410 °C
	Zone 1	Heating chamber 1	7.5 in 191 mm	N2	800 °C
	Zone 2	Heating chamber 1	7.5 in 191 mm	N2	850 °C
	Zone 3	Heating chamber 1	7.5 in 191 mm	N2	850 °C
	Zone 4	Heating chamber 1	7.5 in 191 mm	N2	685 °C
Cooling	Trans Tunnel	Heat/cool barrier, single ed	15 in 381 mm	N2	510 °C
	Gas Convection Cooling	Cooling section	30 in 762 mm	N2	295 °C
Product Unload	Unload Station	Exit unload area	15 in 381 mm	none	ambient
	Unload Table Extension	Exit unload area	15 in 381 mm	none	ambient
	Frame Adjustment		1 in 25 mm		
	Total		151.0 in 3835 mm		

Process Gas

	Actual Conditons		Typical		Typical (Low O2)		Max (all flowmeters open)	
Furnace Replenishment Rate			2.0 rep/min		3.5 rep/min		4.5 rep/min	
	Temp °C	Press psi	Min Flow scfh	Min Flow sL/m	Typical scfh	Typical sL/m	scfh	Max Compressor sL/m
N2 Supply	21	70	242	114	408	193	1,085	512
TOTAL PROCESS GAS			242	114	408	193	1,085	512

Exhaust Gas

	Temp °C	Press in H_2O	Min Flow scfh	Min Flow sL/m	Typical scfh	Typical sL/m	scfh	Maximum Exhaust sL/m
N2 & none mix	200	6	121	57	196	93	348	164

Cabinet Ventilation

Cabinet Ventilation Fans (vent to room or exhaust system)	Flowrate	1100 cfm	1870 m3/h
	Temperature	<86°F	<30°C
Control Cabinet Ventilation Fans (vents to room)	Flowrate	0 cfm	0 m3/h
	Temperature	<86°F	<30°C

Transport System

Belt width	9.5 in 241.3 mm	Belt Edge Heater(s):	30 in., 1 Pair
Belt type	Balanced spiral weave		
Product height	2 in (50.8 mm) above belt level	Baffle plate clearance:	0.5 in. (13 mm) above belt
Belt speed range	1-20 ipm	25-500 mm/m	
Conveyor height	36.0 in +/- 1.5 in adjustable	914.4 mm +/-38.1 mm	adjustable

Electrical System

Voltage required	380 Vac, 50 Hz, 3 Ph
Maximum power required	26.6 kW, 40.3 A
Typical (operating) power required	13.6 kW, 20.6 A

Materials of Construction

Heating Chamber	304 Stainless steel	Cooling	Aluminum, aircraft	Belt	Nichrome V, 80%Ni,20%Cr, <1% Fe
Baffle & Eductor	304 Stainless steel	Belt support	Quartz rod, Quartz tube	Frame	Steel, epoxy or powder coated
Heating element	Quartz, near infrared	Belt Return	UHMW-PE	Cover Panels	18GA steel, epoxy coated

Furnace Dimensions

	Length	Width	Height (floor to stack)		Total Net Wt
Furnace, English	121 in	37 in	68 in +/- 1.5 in	Gross Wt:	1600 LB
Furnace, Metric	3073 mm	940 mm	1727 mm +/- 38.1 mm		730 kg
Crate, English	130 in	44 in	84 in	Gross Wt:	2000 LB
Crate, Metric	3302 mm	1118 mm	2134 mm		910 kg
Crated Furnace with CXE15, English	136 in	44 in	84 in	Gross Wt:	2075 LB
Crated Furnace with CXE15, Metric	3454 mm	1118 mm	2134 mm		950 kg
Crated Furnace with CXE15 & CXX15, Eng	151 in	44 in	84 in	Gross Wt:	2150 LB
Crated Furnace w CXE15 & CXX15, Metric	3835 mm	1118 mm	2134 mm		980 kg

Standard Conditions Pressure 14.7 psia 101.3 kPa Temperature 70 °F 21 °C

LA-309XN CONTROLLED ATMOSPHERE FURNACE WITH 9.5 IN. WIDE BELT, 4 FURNACE CONTROL ZONES, FOR N2 PROCESS GAS, 10-500 MM/MIN BELT SPEED, 380VAC 3PH 50/60 HZ, ENTRANCE BAFFLE W/ EDUCTOR, AND TRANSITION TUNNEL, SINGLE EDUCTOR.

Code	Equipment (For description and details follow links at bottom of page)	# In Base Price # - Priced Option n=not included, STD=Standard Equip
AFR	AIR FILTER / TRAP / REGULATOR	n
APS	AIR PURIFICATION SYSTEM	n
AR1	AIR RESERVOIR (BELT TENSIONER)	1-STD
AR10	AIR RESERVOIR (10 GAL)	n
BCW	BELT, SS, CLOSE WEAVE	n
BE	ENTRANCE BAFFLE W/ EDUCTOR	1-STD
BNV	BELT, NI-CHROME V (<1% Fe CONTENT)	1 in BASE
BSS	BELT, STAINLESS STEEL	n
BX	EXIT BAFFLE W/ EDUCTOR	n
BXO	EXIT BAFFLE W/O EDUCTOR	n
CACT	CONTROLLED ATMOSPHERE COOLING TUNNEL, 760 mm (30 in.)	1 in BASE
CAWC	CLOSED ATMOSPHERE WATER COOLED TUNNEL, 30"	n
CB-1	CIRCUIT BREAKER, 1-PH (REQUIRED FOR UL)	n
CB-3	CIRCUIT BREAKER, 3-PH (REQUIRED FOR UL)	1 - Priced OPTION
CDA-L	CDA LOCKOUT, MANUAL, 1/2 INCH, 250 PSI	n
CDA-S	CDA AUTO SHUTDOWN	n
CE	CE MARK - CONFORM TO APPLICABLE EC-DIRECTIVES, ADDS ENGLISH DOCS, CERT, LABELS & 3-PH EMC LINE FI	n
CFL	CABINET FANS, LOWER	n
CHAMBER	CHAMBER, FURNACE HEATING, STAINLESS STEEL	1-STD
CM	TURBULENT AIR COOLING MODULE, 30"	n
CMB30	CROSS-FLOW FAN COOLING MODULE, 30"	n
CMB45	CROSS-FLOW FAN COOLING MODULE, 45"	n
CRTDOM	CRATING FOR DOMESTIC SHIPMENT	n
CRTINT	CRATING FOR INTERNATIONAL SHIPMENT	1 - Priced OPTION
CWWC	COLD WALL HIGH EFF WATER COOLING MODULE, 508 mm (20-in.)	n
CXE15	ENTRANCE CONVEYOR EXTENSION, 380 mm (15 in.)	1 - Priced OPTION
CXX15	EXIT CONVEYOR EXTENSION, 380 mm (15 in.)	1 - Priced OPTION
DCA	ADD DRYER CHAMBER, 30"	n
DGO	DUAL GAS OPERATION	n
DOCM	FURNACE OWNERS MANUAL	1-STD
DOCR	FURNACE REFERENCE MANUAL	1-STD
DPLD	DRIP PAN WITH LEAK DETECTOR	n
DSC	THREE PHASE SAFETY DISCONNECT	n
EH	EDGE HEAT, RIGHT AND LEFT, WITH OIT-BASED SCR CONTROL	1 - Priced OPTION
ELEC-1PH	ELECTRICAL SYST, SINGLE PHASE	
ELEC-3PH	ELECTRICAL SYST, THREE PHASE	
EM	LAMP ELEMENT FAILURE DETECTION SYST, HMI INTEGRATED, CURRENT SENSING	1 - Priced OPTION
EME	EMO, ENTRANCE, SEMI S2 COMPLIANT, VERTICAL MOUNT	2-STD
EMT	EMO, ENTRANCE, SEMI COMPLIANT, TOP MOUNT	n
EMX	EMO, EXIT, SEMI S2 COMPLIANT, VERTICAL MOUNT	2-STD
ENG	ENGLISH UNITS OF MEASURE	n
ETM	ELAPSED TIME METER	1 in BASE
FHS	FURNACE HEATING SECTION	1-STD
FM	INDEPENDENT ZONE FLOW CONTROL	1-STD
FZN	ADD FURNACE CONTROL ZONE	n
GSM	SUPPLY GAS MIXING SYSTEM, 0-3600 PSIG	n
GUIDE	GUIDE, BELT, PAIR @ ENT/EXIT	1-STD
GUIDES	PRODUCT GUIDES, MANUALLY ADJ	n
HC	HERMETIC CHAMBER (ALLOWS N2, N2/H2 & FG OPERATION)	1 in BASE
HD	HYDROGEN DETECTION	n
HO	HYDROGEN OPERATION	n
HO/NHM	NITROGEN/HYDROGEN MIXING	n
HSK	HANDSHAKE SIGNALING, UP & DOWNSTREAM EQUIPMENT	n

LCI Furnaces DIVISION OF LOCHABER CORNWALL INC	EQUIPMENT LIST	DOC NBR: 13-0xx	802-101410 R1
CUST:	BASE EQUIPMENT AND OPTIONS	MODEL: LA-309XN	DATE 03/25/13
		S/N: 13030913	APVL JCLARK 9/8/11
		SIZE: A PRNT 04/10/13	NUMBER OF SHEETS 2

LA-309XN CONTROLLED ATMOSPHERE FURNACE WITH 9.5 IN. WIDE BELT, 4 FURNACE CONTROL ZONES, FOR N2 PROCESS GAS, 10-500 MM/MIN BELT SPEED, 380VAC 3PH 50/60 HZ, ENTRANCE BAFFLE W/ EDUCTOR, AND TRANSITION TUNNEL, SINGLE EDUCTOR.

Code	Equipment (For description and details follow links at bottom of page)	# In Base Price # - Priced Option n=not included, STD=Standard Equip
HT	HIGH TEMPERATURE OPERATION (1000C MAX)	1 in BASE
IPC	INDEPENDENT PID CONTROLS	n
IPS	INLET PRESSURE SWITCH (GAS)	n
IR-E	INTERFACE ROLLER ASSEMBLY, ENTRANCE, SMALL DIA	n
IR-X	INTERFACE ROLLER ASSEMBLY, EXIT, SMALL DIA	n
LAMPIR	INFRARED HEATING ELEMENTS	32 in BASE
LFI	POWER LINE INTERFERENCE FILTER	n
LOAD	LOAD STATION, 15 INCH	1-STD
LT	LIGHT TOWER, 3-COLOR, PROCESS READY/ALARM	n
LTR	BELT DIRECTION, LEFT TO RIGHT	1-STD
MA	MOISTURE (DEWPOINT) ANALYZER	n
NO	NITROGEN OPERATION	1 in BASE
OA	OXYGEN ANALYZER EC913 DIGITAL DISPLAY, H2 READY	n
OI	FURNACE CONTROL SOFTWARE	1-STD
OIT	FURNACE CTRL OPERATOR INTERFACE TERMINAL	1 - Priced OPTION
OS7	CONFIG WINDOWS 7 OS FOR FURNACE CONTROL	1 - Priced OPTION
OSS	ON-LINE GAS SAMPLING SYSTEM FOR MA OR OA (3 ZONES + SOURCE)	n
OSXP	WINDOWS XP OPERATING SYSTEM	n
OT	OVERTEMP MONITOR, SHUTDOWN ALARM (QTY x 8 CH)	n
PC	COMPUTER, DELL OPTIPLEX, WINDOWS 7 OPERATING SYSTEM	1-STD
PCM	COMPUTER, MONITOR, PROFESSIONAL, 17" LCD	1-STD
PCMS	COMPUTER, MONITOR, PROFESSIONAL, 19" SPECIAL	n
PF-SS	STAINLESS STEEL PLUMBING & FITTINGS	n
PH1	PRODUCT CLEARANCE, 1" MAX HEIGHT, PRECISION HT DESIGN	n
PH2	STD PRODUCT HEIGHT, 2 INCHES (50 mm) HIGH	1-STD
PH4	PRODUCT CLEARANCE, 4" HEIGHT	n
PLC	PROGRAMMABLE FURNACE CONTROLLER	1-STD
RAID	RAID1 CONFIGURATION & HDWRE	1 - Priced OPTION
RCT	RAPID COOL TRANSITION, DUAL EDUCTORS	n
RTL	BELT DIRECTION, RIGHT TO LEFT	n
SENSLAS	PRODUCT SENSOR, CMOS LASER SYSTEM, INTEGRATED WITH AUDIBLE ALERT	1 - Priced OPTION
SFIN	FINISH, STONE GREY, 2-PART POLYURETHANE	1-STD
SHIP	SHIPPING & HANDLING	1-STD
SI	METRIC UNITS OF MEASURE, (OI)	1-STD
SMEMA	SMEMA LANE CONTROL	n
TENSIONER	TRANSPORT TENSIONER SYSTEM	1-STD
TF	TRANSITION TUNNEL, INSULATED FURNACE COOLING	n
TRANSPOR	TRANSPORT DRIVE SYSTEM	1-STD
TT	TRANSITION TUNNEL	n
TTDE	TRANSITION TUNNEL, DUAL EDUCTOR	n
TTSE	TRANSITION TUNNEL, SINGLE EDUCTOR	1 in BASE
UC	ULTRASONIC CLEANER	n
UCD	ULTRASONIC CLEANER DRYER WITH RECIRC	n
UCF	UCD WATER FILTER, EXTERNAL QUICK DISCONNECT	n
ULOAD	UNLOAD STATION, 15 INCH	1-STD
UPS	UNINTERRUPTABLE POWER SUPPLY,OIT/PLC (1500 VA)	n
UT	UNIVERSAL TRANSFORMERS (ALL PRIMARY SYSTEMS)	1-STD
W-SS	STAINLESS STEEL WORK SURFACES, ENT/EXIT	1-STD

Features http://www.lcifurnaces.com/Furnaces/furnaceattributes.php
Options http://www.lcifurnaces.com/Furnaces/standard_features_A-B.php

LCI Furnaces DIVISION OF LOCHABER CORNWALL INC	EQUIPMENT LIST, COMPUTER	DOC NBR: 13-0xx	802-101420 R 2
CUSTOMER		MODEL: LA-309	DATE 12/01/10
		S/N: 13030613xx	APVL JCLARK 9/20/11
		SIZE: A PRNT 04/09/13	SHT 1 of 1

Part Number	Qty	Description	Dell Service Tag: 4xxxxxx
802-101420-01	1	Furnace Computer System, Dell Optiplex, consisting of LCD monitor, dual hard drive/RAID array, 2 TC/IP network interface, 1 wireless-N, 1 USB optical mouse, 1 USB keyboard, 1 DVD +/-RW Optical drive, and as detailed below:	

Part Number	Qty	Description
223-6623	1	OptiPlex 990 Minitower, Intel i3-220 (3.3 GHz, 3 M)
317-7187	1	2.0 GB,Non-ECC,1333 MHz DDR3 2x1GB Memory
331-2024	1	Dell USB Keyboard,No Hot Keys English,Black,Optiplex
320-1097	1	Dell P170S, Professional Monitor, 17 Inch Flat Panel, LCD, 17.0 Inch Viewable Image Size
320-5170	1	Integrated NVIDIA Quadro HD2000 Graphics
341-7870	1	250 GB RAID1 (2x250 Gb) SATA 6.0Gb/s and 8Mb Data Burst Cache,Dell OptiPlex Minitower
469-0475	1	Windows 7 Professional Service Pack 1, 32-bit
330-9458	1	Dell USB-Optical Mouse with Scroll,Black,OptiPlex
313-4794	1	Wireless-N 1520 PCIe WLAN card
TEG-PCITXR	1	PCI 10/100/1000 Mbps high bandwidth netowrk adapter
318-0546	1	16X DVD+/-RW SATA
331-1571	2	Resource DVD, diagnostics and drivers
938-5222	2	Basic Support: Next Business Day Parts and Labor Onsite Response 2 Year Extended
951-4780	2	Basic Support: Next Business Day Parts and Labor Onsite Response Initial Year
929-6247	2	Dell Hardware Limited Warranty Plus Onsite Service Initial Year
935-2078	2	Dell Hardware Limited Warranty Plus Onsite Service Extended Year(s)

REVISION	DESCRIPTION	BY	DATE
3	CHANGE COMPUTER TO DELL OPTIPLEX 990	JCLARK	28Sep11
2	CHANGE COMPUTER TO DELL OPTIPLEX 780	JCLARK	20Apr10
1	CHANGE COMPUTER TO DELL OPTIPLEX 740	JCLARK	1Sep09

LCI LOCHABER CORNWALL INC

COMPUTER CERTIFICATE

JOB OR LOCATION	13-0xx		
CUSTOMER OR USER	new		
FURNACE MODEL	LA-309	FURNACE SERIAL NUMBER	13030913xx
Model	OPTIPLEX 990		
SERVICE TAG	0x0xxx0		
EXPRESS SERVICE CODE	00000000000		
OS	WINDOWS 7 PRO OA	SP	1
PRODUCT KEY	XXXX - XXXX0 - XX0XX - XXXXX - XXXXX		
COMPUTER NAME	0x0xxx0	IP	10.192.105.100
LOGIN	Furnace1	SUBNET	255.255.255.0
PASSWORD	none	DNS server	10.192.105.1
LogMeIn	info@furnacepros.com	COMPUTER NAME	12-004 Analog
PASSWORD	furnace0302	ACCESS CODE:	fpd12004
DEVICE	LCM4	IP	10.192.105.102
INTERFACE	M4SENET-100	SUBNET	255.255.255.0
MAC	00:A0:3D:01:F4:88	GATEWAY	none
SOFTWARE	PROCONTROL	ED	11.0424.120119
PRODUCT KEY	operator: 1 engineer: 2		
SOFTWARE			
PRODUCT KEY			
WARRANTY PROGRAM	DELL NEXT BUSINESS DAY SUPPORT	EXPIRES:	1/10/2015

BY: JMC James M Clark DATE: 9-Oct-12

The power to do more

Dell™ OptiPlex™ 990 desktop

The premier OptiPlex 990 is Dell's most powerful and flexible desktop solution designed for best-in-class performance and collaboration, while enabling business-class control. It delivers premier technology that helps simplify systems management and security and is available in four different chassis sizes that blend seamlessly into office environments and respect our planet.

New flexible design

The completely redesigned form factors are amongst the smallest within their categories. The mini-tower, desktop and small form factor chassis have been optimized to help maximize desk space and ensure the systems integrate seamlessly in virtually any office environment. The Dell OptiPlex 990 also shares the same visual identity as OptiPlex 790 and 390 to offer a more consistent look across the OptiPlex portfolio and two All-in-One stands enable deployment as a single device with up to 24" displays. Accessibility and serviceability are easy thanks to the convenient side-latch mechanism which makes access to key system components for upgrades and services fast and easy. The form-factor flexibility has also been designed with our planet in mind. The systems all have a minimum of 10% post-consumed recycled plastic enclosure and offer highly efficient power supplies options. Starting with OptiPlex 990 small form factor and with Dell also provides select brominated flame retardant free (BFR-free) and polyvinyl chloride free (PVC-free) configurations[12] and recyclable packaging. By using post-consumed recycled plastic content in the chassis of more models, the new generation of OptiPlex is Dell's most environmentally responsible commercial desktop offering.

Premier performance and productivity

The OptiPlex 990 is the most powerful OptiPlex ever. It equips your workforce with great productivity tools such as the advanced 2nd generation Intel® Core™ i7 vPro™ processor featuring generous high-speed memory options and support for up to four simultaneous video displays across small-form factor, desktop and minitower chassis with dual PCI-express slots. The OptiPlex 990 also supports flexible desktop virtualization deployment models to help users get up and running fast and have their data centrally stored to avoid downtime. OptiPlex 990 supported virtualization solutions range from virtual remote desktop control to on-demand desktop streaming or client hosted virtualization.

Premier-class control

The OptiPlex 990 integrate the latest Intel® vPro™ remote management technology, along with the Dell Data Protection security capabilities such as one-touch preset compliance policy templates, flexible encryption and single solution for system disk as well as removable medias that work in your unique environment. A premier-class range of security and management options which allows security and remote control configurations to meet large organizations unique needs and challenges. Dell KACE system management appliances are fully-compatible with the OptiPlex 990 desktops enabling easy deployment of remote manageability and maintenance simplification. The OptiPlex technological assets are backed with proven professional IT services and support worldwide, ranging from deployment to maintenance or web solutions to help IT to simplify their daily tasks. The OptiPlex platform commitment to stability, long-lifecycle and managed transitions also help ensure IT to save time and money.

Dell OptiPlex 990

Designed to deliver best-in-class productivity and business-class control for great return on investment

OptiPlex 990 Technical Specifications					
Processors[1]	Intel® 2nd Generation Core™ i7, I5, i3 Processors. Intel vPro™ Technology available on select processors				
Chipset	Intel® Q67 Express Chipset				
Operating System Options	Microsoft® Windows 7® Home Basic (32/ 64 bit),Microsoft® Windows 7® Home Premium (32/64 bit), Microsoft® Windows 7® Professional (32/64 bit), Microsoft® Windows 7® Ultimate (32/64 bit) Windows Vista® Home Basic SP2 (32/64 bit), Windows Vista® Business SP2 (32/64 bit), Windows Vista® Ultimate SP2 (32 bit) Ubuntu® Linux (select countries); FreeDOS for N-series				
Video[2]	Integrated Intel® HD Graphics 2000 [with iCore Dual/Quad core class CPU-GPU combo]; optional 1GB AMD RADEON HD 6670 (MT only); optional 1GB AMD RADEON HD 6450; optional 512MB AMD RADEON HD 6350				
Memory[3]	Up to four DIMM slots, Non-ECC dual-channel 1333MHz DDR3 SDRAM, up to 16GB				
Networking	Integrated Intel® 82579LM Ethernet LAN 10/100/1000; optional Broadcom® NetXtreme® 10/100/1000 PCIe card; optional Dell Wireless 1520 PCIe (MT, DT, SFF); optional half-mini PCIe (USFF) WLAN card (802.11n)				
I/O Ports	10 External USB 2.0 ports and 1 Internal USB 2.0 (MT & DT only);1 Serial; 1 RJ-45; 1 VGA; 1 DisplayPort; 2 PS/2; 2 Line-in (stereo/microphone), 2 Line-out (headphone/speaker), optional Parallel/2nd Serial PCIe card (MT), optional 2nd Serial PCIe card (DT & SFF), optional 1394a PCI card (MT & DT); optional USB 3.0 PCIe card				
Removable Media Options	Blu-ray Writer Drive; DVD+/-RW; DVD-ROM; Dell 19 in 1 Media Card Reader (MT & DT only)				
Hard Drives[4] Options	3.5" Hard Drives: up to 1TB 7200 RPM SATA 3.0Gb/s; 2.5" Hard Drives: up to 500GB 7200 RPM SATA 3.0GB/s; 500GB Hybrid; 320GB 7200 RPM Opal SED, 128GB Solid State Drive RAID 0 & 1 support on select configurations; Supports Dell's Flexible Computing Solution diskless option				
Chassis		Minitower (MT)	Desktop (DT)	Small Form Factor (SFF)	Ultra Small Form Factor (USFF)
	Dimensions (H x W x D) Inches/(cm)	14.2 x 6.9 x 16.4 / (36.0 x 17.5 x 41.7)	14.2 x 4.0 x 16.1 / (36.0 x 10.2 x 41.0)	11.4 x 3.7 x 12.3 / (29.0 x 9.3 x 31.2)	9.3 x 2.6 x 9.4 / (23.7 x 6.5 x 24.0)
	Min. Weight (lbs/ kg)	19.55 / 8.87	16.67 / 7.56	12.57 /5.70	7.20 / 3.27
	Number of Bays	2 internal 3.5" 2 external 5.25"	1 internal 3.5" 1 external 5.25"	1 internal 3.5" 1 external 5.25" (slimline)	1 internal 2.5" 1 external 5.25" (slimline)
	Expansion Slots	1 full height PCIe x16 1 full height PCIe x16 (wired x 4) 1 full height PCIe x1 1 full height PCI	1 half height PCIe x16 1 half height PCIe x16 (wired x 4) 1 half height PCIe x1 1 half height PCI	1 half height PCIe x16 1 half height PCIe x16 (wired x 4)	1 miniPCIe connector
	Power Supply[5] Unit (PSU)	Standard 265W PSU or optional 265W up to 90% Efficient PSU; Energy Star 5.0 compliant, Active PFC	Standard 250W PSU or optional 250W up to 90% Efficient PSU; Energy Star 5.0 compliant, Active PFC	Standard 240W PSU or optional 240W up to 90% Efficient PSU; Energy Star 5.0 compliant, Active PFC	200W up to 90% Efficient PSU, ENERGY STAR® 5.0 compliant, Active PFC
Peripherals Options	Monitors: Dell Entry Standard and Widescreen Flat Panel Analog: Dell E170S, E190S, E1709W, E1910, E1911, E2011H, E2210H, E2211H, E2311H Dell Professional Digital Standard and Widescreen Flat Panel: Dell P170S, P190S, P1911, P2011H, P2210, P2211H, P2311H, P2411H Dell UltraSharp Digital Standard and Widescreen Flat Panel, Adjustable Stand: Dell 2007FP, U2211H, U2311H, U2410, U2711, U3011				
	Keyboards: Dell USB Entry Keyboard, Dell Multimedia Pro Keyboard, Dell Smartcard Keyboard				
	Mouse: Dell USB Optical Mouse, Dell Laser Mouse				
	Audio Speakers: Internal Dell Business audio speaker, Dell AX210 2.0 and AY410 2.1 Desktop Speakers; Dell AX510 and AX510PA Sound Bar Speakers				
Security	Trusted Platform Module[6] (TPM) 1.2, Dell Data Protection / Access, Chassis lock slot support, optional Chassis Intrusion Switch, Setup/BIOS Password, I/O Interface Security, optional Smart Card keyboards, Intel® Trusted Execution Technology, BIOS support for optional Computrace[7]				
Systems Management Options[8]	Intel® vPro Technology (iAMT 7.x); Intel® Standard Manageability; No Out of Band Systems Management				
Environmental, Ergonomic, & Regulatory Standards	Environmental Standards (eco-labels): Energy Star 5.0, EPEAT Registered (see epeat.net for registration status by country),. CECP, TCO, WEEE, Japan Energy Law, Japan Green PC, South Korea Eco-label, EU RoHS, China RoHS, Blue Angel Other Environmental Options: Dell Energy Smart settings; Carbon Off-set Program; System Recycle (Asset Recovery Service)				
Warranty	Limited Hardware Warranty[9]; Standard 3-year Next Business Day On Site Service after Remote Diagnosis[10] (3-3-3); Optional 3-year Dell ProSupport™ for IT; 4 year and 5 year service and support options[11]				

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***Important Information: Remote Diagnosis is determination by online/phone technician of cause of issue; may involve customer access to inside of system and multiple or extended sessions. If issue is covered by Limited Hardware Warranty and not resolved remotely, technician and/or part will be dispatched, usually within 1 business day following completion of Remote Diagnosis. Availability varies.Other conditions apply. For copy of Ltd Hardware Warranty, write Dell USA LP, Attn: Warranties, One Dell Way, Round Rock, TX 78682 or see www.dell.com/warranty.**

1. Offering may vary by region.
2. System Memory and Graphics: Significant system memory may be used to support graphics, depending on system memory size and other factors.
3. 4GB or Greater System Memory Capability: A 64-bit operating system is required to support 4GB or more of system memory.
4. Hard Drive: GB means 1 billion bytes and TB equals 1 trillion bytes; actual capacity varies with preloaded material and operating environment and will be less.
5. PSU: This form factor utilizes a more efficient Active Power Factor Correction (APFC) power supply. Dell recommends only Universal Power Supplies (UPS) based on Sine Wave output for APFC PSUs, not an approximation of a Sine Wave, Square Wave, or quasi-Square Wave (see UPS technical specifications). If you have questions please contact the manufacturer to confirm the output type.
6. TPM: TPM is not available in all regions.
7. Computrace: Not a Dell offer. Certain conditions apply. For full details, see terms and conditions at www.lojackforlaptops.com.
8. Systems Management Options:
   - Intel® vPro Technology - Fully vPro-capable at point of purchase, the vPro systems management option requires vPro processors. Includes support for Intel Advanced Management Technology (AMT) 7.1.x.
   - Intel® Standard Manageability - Fully enabled at point of purchase, the Intel Standard Management option is a subset of the AMT features. ISM is not upgradeable to vPro technology post-purchase.
   - No Out-of-Band Systems Management - This option entirely removes Intel out of band systems (OOB) management features. The system can still support in band management. OOB management support through AMT cannot be upgraded post-purchase.
9. Limited Hardware Warranty: For copy of Ltd Hardware Warranty, write Dell USA LP, Attn: Warranties, One Dell Way, Round Rock, TX 78682 or see www.dell.com/warranty.
10. Next Business Day Onsite Service after Remote Diagnosis: Remote Diagnosis is determination by online/phone technician of cause of issue; may involve customer access to inside of system and multiple or extended sessions. If issue is covered by Limited Hardware Warranty (www.dell.com/warranty) and not resolved remotely, technician and/or part will be dispatched, usually within 1 business day following completion of Remote Diagnosis. Availability varies. Other conditions apply.
11. Dell Services: Availability and terms of Dell Services vary by region. For more information, visit www.dell.com/servicedescriptions.
12. OptiPlex 990 small form factor (coming in May in US, UK and Japan) is brominated flame retardant free (BFR-free) and polyvinyl chloride free (PVC-free), meeting the definition of BFR-/PVC-free as set forth in the IMEI Position Statement on the 'Definition of Low-Halogen Electronics (BFR-/CFR-/PVC-free)'. Plastic parts contain less than 1,000 ppm (0.1%) of bromine (if the Br source is from BFRs) and less than 1,000 ppm (0.1%) of chlorine (if the Cl source is from CFRs or PVC or PVC copolymers). All printed circuit board (PCB) and substrate laminates contain bromine/chlorine total less than 1,500 ppm (0.15%) with a maximum chlorine of 900 ppm (0.09%) and maximum bromine being 900 ppm (0.09%).

OptiPlex 990

The power to do more

LCI Furnaces
DIVISION OF LOCHABER CORNWALL INC

Customer:

FLOWMETER SETTINGS

DOC NBR:	STD -	802-101460-01			R0
MODEL:	LA-309XN		DWN:	SLB	08/25/11
SERIAL NBR:	13030913XX		APVL:	JMC	01/25/13
PRINT:	09Apr13		PM:	JMC	01/28/13

PROCESS GAS

GAS1	N2	Nitrogen
GAS2	none	none

L/m

SETTINGS FOR PROFILE: SINGLE GAS MODEL

Replenish Rate is the number of times/minute that the furnace (or a section of the furnace) evacutes its gas

Replenish Rate	Furnace or Section Replenishes/Hour	Time to Refresh Furnace or Section
1 times/minute	60 times/hour	60 seconds
2 times/minute	120 times/hour	30 seconds
3 times/minute	180 times/hour	20 seconds
4 times/minute	240 times/hour	15 seconds

Different sections of the furnace can be replenished at different rates, if required

Flowmeters graduated in: sL/m (lg=RMC flowmeters, sm=small RMA flowmeters)

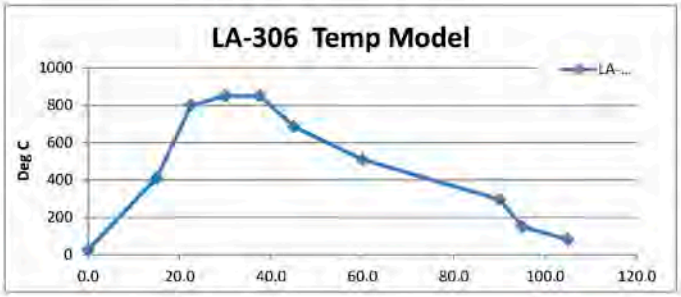
BALANCE

211.8 scfh difference => Positive pressure in furnace to purge O2
100.0 sL/m grad 173.9% incr (decr) of inflows over outflows

No.		Location	Label	Metered Gas	Flowmeter Size L/m	1 per Minute Replenish Rate Flow Setting sL/m grad	Desired Replenish Rate per Minute	Initial Flowmeter Setting scfh grad	Initial Flowmeter Setting sL/m grad
1	BE	Entrance barrier	ENTR BAFFLE	N2	100	15	3.1	44	21
2	Z1	Heating chamber 1	ZONE 1	N2	100	22	9.2	62	29
3	Z2&Z3	Heating chamber 1	ZONES 2 & 3	N2	100	38	14.5	107	50
4	TTSE	Heat/cool barrier, single ed	TRANS TUNNEL	N2	100	15	3.5	43	20
5	CACT	Cooling section	GAS CONVECTION COOLING	N2	100	16	1.7	46	22
6	HC	Heat chamber sides	LAMP SEALS	N2	100	23	2.6	65	31

EXHAUST

							distr %		
7	EEBE	Entrance stack	ENTRANCE EDUCTOR	N2	10		100%	12.5	5.8
							100%		



Furnace Balance	scfh	sL/m
Gas Inflow to furnace	396	186.7
Gas to Eductors	12	5.8
Total Gas Required	408	192.5
- Stack Exhaust Flow	196	92.6
Net inflow	212	100.0
	cu ft	L
Furnace internal volume	3.8	108.4
Velocity at entr & exit	5.4	2.7

PROCESS GAS SUPPLY REQUIREMENTS			Temp °C	Press psi	Gas	scfh	sL/m
1	Gas 1	All	21	70	N2	407.9	192.5
2	Gas 2		21	70	none	0.0	0.0
			STP = 21C, 1 atm		Total	407.9	192.5

LCI Furnaces DIVISION OF LOCHABER CORNWALL INC

QUALITY ASSURANCE

CERTIFICATION OXYGEN CONCENTRATION

DOC NBR:	13-0xx 802-101543		R0
MODEL NBR:	LA-309	DATE	20Sep11
SERIAL NBR:	13030613xx	APVL	JCLARK 18Oct12
SIZE: A	PRNT 9Apr13	SHT 1	OF 1

	MANUFACTURER	MODEL	SERIAL NUMBER		
FURNACE	LCI FURNACES	LA-309	1303061201	TEST DATE	10/19/2012 11:09:13
ANALYZER	ILLINOIS INSTR	EC-913	EC913F-0840112	CALIBRATION REPORT	41150
PROFILER	DATAPAQ	Q18	1077	CALIBRATION REPORT	SW264
GAS	AIRGAS	NITROGEN - ULTRA HIGH PURITY	14-400105061-1	CERTIFIED CONCENTRATION	99.999%

RECIPE SETTINGS

PROFILE NAME: SOLDER SEAL

BELT SPEED: 10 cm/min

SAMPLE PORT: ZONE 3

	ZONE 1	ZONE 2	ZONE 3		OXYGEN
SETPOINT TEMP, °C	280	300	312	PROFILE CRITERIA, PPMV	<20

FURNACE SOFTWARE DISPLAY

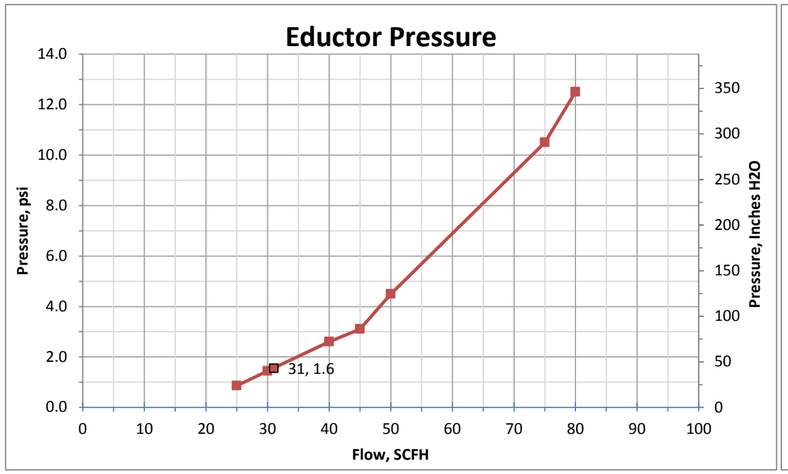
	ZONE 1	ZONE 2	ZONE 3	ZONE 4		OXYGEN
ZONE TEMP, °C	280.1	300.2	311.8	N/A	FURNACE SOFTWARE, PPMV	7

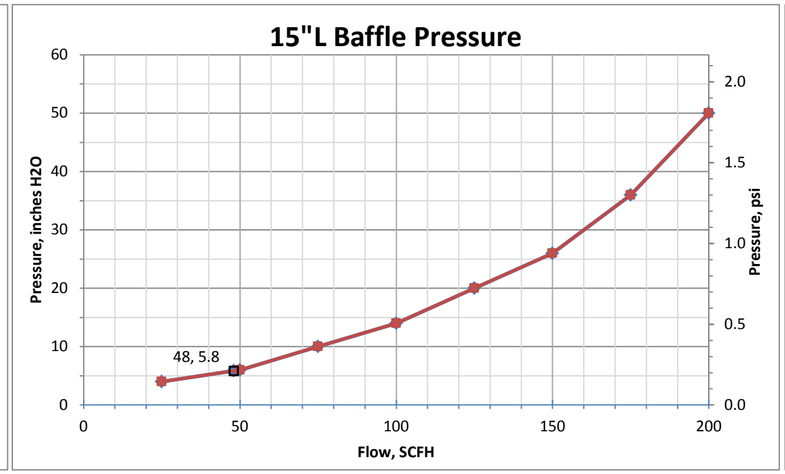
CERTIFIED RESULTS

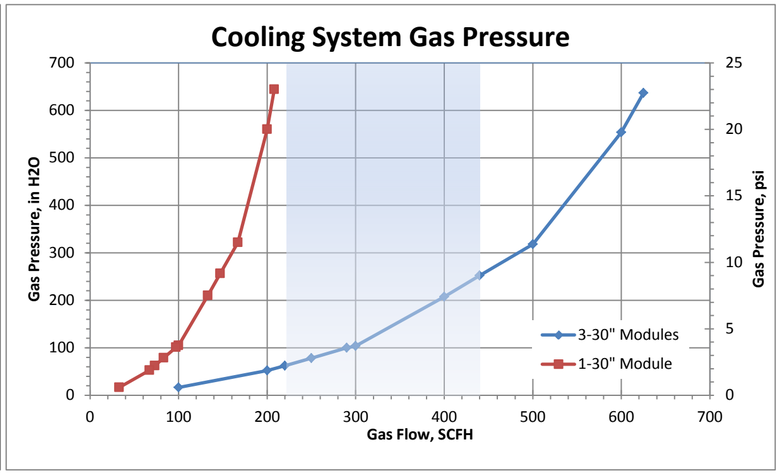
	ZONE 1	ZONE 2	ZONE 3	ZONE 4		OXYGEN
PROFILER MAX, °C	N/A	N/A	N/A	N/A	ANALYZER DISPLAY, PPMV	6.57

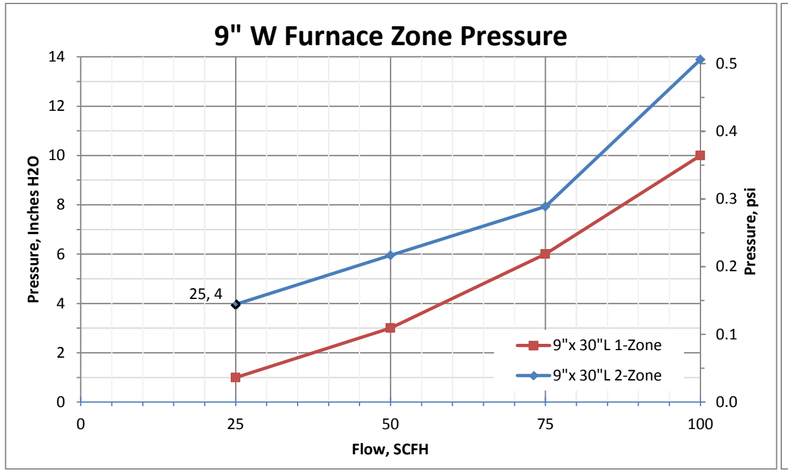
COMMENTS: FINAL O2 VERIFICATION RUN.

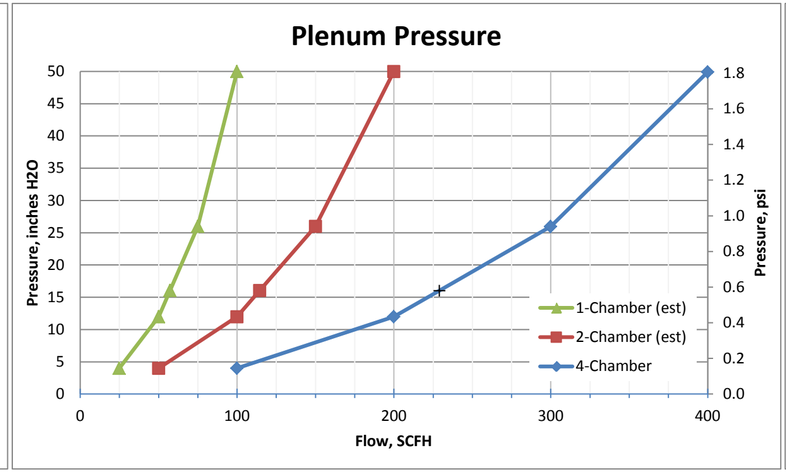
TEST BY: James Clark SIGNATURE: James M Clark DATE: 19-Oct-12

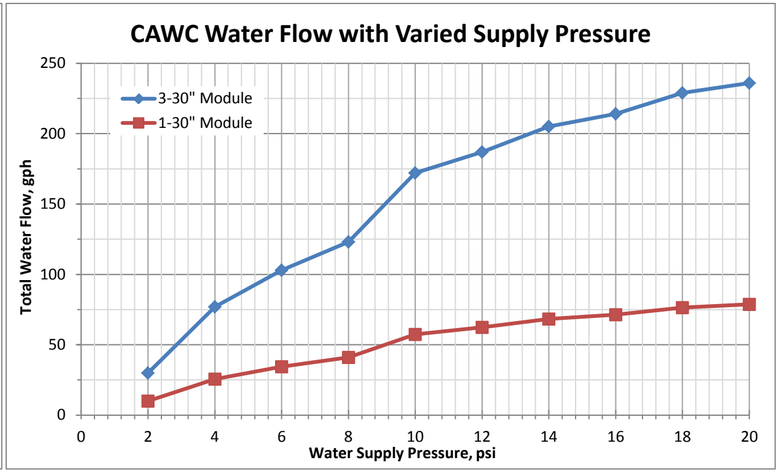












NOTES:

PROCESS GAS TO PLENUMS, EDUCTORS, CHAMBERS, BAFFLES & CAWC

For each gas element tested, the flow was varied and the pressure drop determined by temporary installation of a test pressure gage. Pressures were recorded at each flow.

CAWC COOLING WATER

For the water cooling section, all 6 water flowmeters were opened full and the pressure varied from 2-20 psig.
Flows were recorded for each flow meter at each pressure setting and then summed for total water flow through the CAWC as a function of inlet pressure.
Tests on the CAWC were run as follows:

1) Furnace operating with last zone at approx. 450-460C. CAWC COOLING AIR turned off. Cooling water set to 8 psig. CAWC cooling water varied from 0 to 60 gph (1 gpm). Temperature profiles of the furnace were run at each of 5 Total Water Flow settings. Inlet & outlet water temp recorded
2) Furnace operating with last zone at approx. 450-460C. Cooling water set to 8 psig, Total Water Flow set to 48 gph (8 gph in each of 6 CAWC chambers). CAWC COOLING AIR increased from 0 to 400 scfh. Temperature profiles of the furnace were run at each of 6 water flow settings.

Data suggests the furnace cooling system be operated with 40 to 60 gph Total Water Flow through the CAWC and improve cooling performance by running the CAWC cooling gas at 200-300 SCFH.

REV	DESCRIPTION	BY	DATE

APPROVALS		DATE
DWN	JMC	6/11/11
CHK'D	SBARBER	6/15/11
ENGR	JMC	6/22/11
PM	JMC	7/28/11

LCI Furnaces
DIVISION OF LOCHABER CORNWALL INC
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ORANGE, CALIFORNIA 92868 USA
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TITLE					
IR FURNACE PRESSURE AND FLOW CHARACTERISTICS					
JOB	DOCUMENT NUMBER				REV
STD	802-101470				0
SIZE: B	PRNT: 11/28/12	SN: ALL	SHEET 1	OF 1	