

L&L Aircraft-Grade Furnaces include:



- Zone Control
- Extremely Even Heating
- Proprietary Ceramic Element Holders
- Tight Gradient Uniformity



Heat treatment of tool steels, annealing fasteners, weldment stress relieving, solution heat treatment of aluminum, and heat treatment of rivets, bolts and other parts with industrial furnaces by
L&L Special Furnace Co Inc.

Represented by:

L&L's Popular
FNA Furnace with
integrated quench tank



SPECIAL FURNACE CO INC

Aircraft Maintenance

Quality is Essential

Problem

Many aircraft maintenance facilities require heat treatment. Hardening of tool steels, annealing fasteners, stress relieving of weldments, and solution heat treatment of aluminum are just some of these processes. Most of these are critical where *certifiable uniformity and traceability* are fundamental requirements of the job. Old, unreliable equipment can fail or may not meet the ever changing and increasingly stringent requirements of the aircraft industry (See the description of the AMS 2750D Specification on the back cover). Outsourcing wastes time and money and adds another layer of risk to the control of your most precious asset – your reputation. L&L has several proven solutions.

Solution

L&L Special Furnace Co., Inc. designs, manufactures, and services a wide variety of heat treat equipment. We have several lines that are specific to the aircraft and aerospace industry. See the range of sizes and types on the back cover. Our FNA and XLA series, specifically designed for aircraft industry, include such standard features as calibrated thermocouples, complete NIST documentation certifications, zone control and optional in-house uniformity survey prior to shipment.

Customers

Our US customers include Boeing, NASA Goddard Flight Center, Pratt & Whitney, Rolls-Royce Engine Services, US Air Force, US Airways, Atlantic Southeast Airlines, Northwest Airlines, PCC Airfoils for turbines, Lockheed Martin, Triumph Air Repair, Aero Component Repair, Dallas Airmotive, Chromalloy, and Goodrich Aerostructures. International customers include Philippines Airlines, Air Mauritius, China Air, SriLankan Airlines, HASEL and Coopesa.

Factory uniformity surveys are routinely done to insure certification upon commissioning

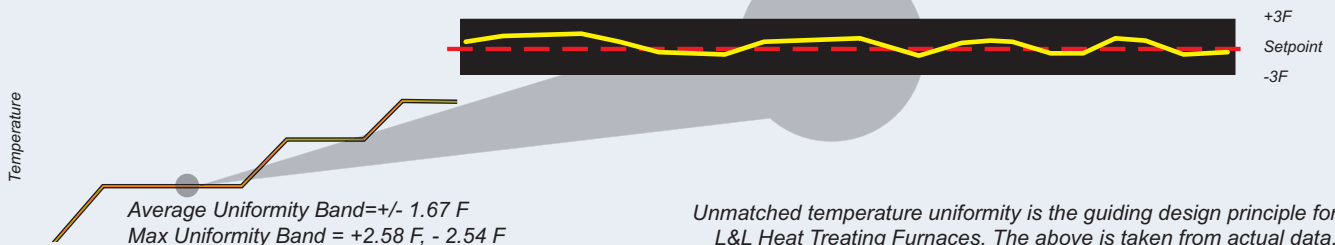


"We have had excellent results with the furnace and it has opened up quite a few new possibilities for our shop."

Cust Wilhelm, Duncan Aviation

With the DynaPro Multi Zone Control System, actual furnace temperature is guaranteed to stay within $\pm 5^{\circ}\text{F}$ ($\pm 2.7^{\circ}\text{C}$) of setpoint!

During a typical test an L&L FNA Furnace temperature stayed within $\pm 3^{\circ}\text{F}$ ($\pm 1.7^{\circ}\text{C}$) of setpoint!



Unmatched temperature uniformity is the guiding design principle for L&L Heat Treating Furnaces. The above is taken from actual data. Call or email for complete data sheets from actual uniformity surveys.





"We have been very pleased with our L&L furnace. The quick ramp up to temp without extreme spiking makes for quicker turn times on our parts. We are also pleased with how tight it holds to set temp."

Kris Schwab, T/L Fab & Tooling
Goodrich Aerostructures

The L&L Difference

Confirmation of Quality

L&L's proprietary element support design system evenly distributes the radiant heat throughout the furnace and promotes the kind of uniformity required for aircraft-grade heat treating. L&L's hard ceramic holders support the heating coils for long life, promote even heat transfer, and allow for easy, quick, inexpensive, in-house maintenance. L&L also uses convection and multi-zone control to guarantee temperature gradients within $\pm 5^{\circ}\text{F}$ ($\pm 2.7^{\circ}\text{C}$) in the work zone.



L&L furnaces are used to heat treat some of the most critical components on an aircraft

Client Satisfaction






L&L Builds a Great Furnace



"Our company, Doctor Furnace, Inc. provides nationwide onsite calibration & testing services to the thermal processing industry. While recently performing a uniformity survey on two L&L furnaces for an aerospace client I was amazed by how uniform both these furnaces were. Both furnace uniformities were actually $\pm 2^{\circ}\text{F}$ at lower temperatures and $\pm 5^{\circ}\text{F}$ at higher temperatures (the requirement was $\pm 10^{\circ}\text{F}$ from 250°F to 1400°F on one furnace, and $\pm 10^{\circ}\text{F}$ from 450°F to 1600°F on the second furnace). In the fifteen years I have conducted temperature uniformity surveys, which include many types of furnaces, this is one of the BEST I have ever tested. With the thermal processing specifications that govern the Aerospace, Automotive and Nuclear Industries getting tighter & tighter, it is good to see a furnace manufacturer that can provide equipment that can stand up to these specifications. I will not hesitate to recommend to any one of my clients who may be looking for an excellent, heat treat furnace, L&L Special Furnace has my vote of confidence."

Andrew Bassett, Director of Quality/Business Development, Doctor Furnace, Inc. (www.DoctorFurnace.com)

L&L SPECIAL FURNACE CO, INC. AVIATION MARKET PRODUCTS COMPARISON SHEET

	Small inexpensive general purpose heat treating box furnace	Small to medium size, dual chamber tempering/hardening furnaces	High uniformity, intermediate size, single chamber box furnaces	Small to large chamber, high convection ovens	Large furnaces for low to high temperatures with protective atmosphere
SERIES/MODEL	MODEL GS1714	QDS AND QDA SERIES	XLA SERIES	VBA/DVA/DRA SERIES	FNA SERIES
PHOTOGRAPH OF TYPICAL MODEL					
COMMENTS	Inexpensive, off-the-shelf model, few options	Dual chamber system with a separate high temperature hardening furnace and tempering oven chambers. Various quench tanks available.	Selected Sizes based on Standard XLE Series Furnaces. Aviation package. Can be uniform from 300°F to 2350°F with protective atmosphere capability.	Selected Sizes based on Standard DV & DR Series Ovens. Aviation package.	Large. Custom sizes. Heavy-duty loaders. Aviation package. Can be uniform from 300°F to 2350°F with protective atmosphere capability.
APPLICATIONS	Tool room heat treating / multi-purpose	Tool steel hardening and tempering / aluminum solution treating and aging	Full range of aviation heat treating solutions	As companion to XLA series - steel tempering; post-welding stress relief; aluminum heat treating	Full range of aviation heat treating solutions
SIZE RANGE (UNIFORM VOLUME)	One Size only 16" W X 10"H x 13" D (40 cm X 25 cm X 33 cm) 1.2 cubic feet (34 liters)	(8) Sizes from 1.15 cubic feet (33 liters) to 5.8 cubic feet (165 liters)	(27) Sizes from 1.95 cubic feet (55 liters) to 58.3 cubic feet (1651 liters) uniform space	(9) Sizes from 2 cubic feet (56 liter) to 54 cubic feet (1530 liters)	(11) Sizes from 8 cubic feet (227 liter) to 216 cubic feet (6116 liters)
TEMPERATURE RANGE	300°F to 2350°F (150°C to 1290°C)	300°F to 2350°F (150°C to 1290°C)	300°F to 2350°F (150°C to 1290°C)	300°F to 1300°F (150°C to 700°C)	300°F to 2200°F (150°C to 1200°C)
ACCESSORIES			See list below		See list below

AVIATION PACKAGE (FOR XLA & FNA SERIES FURNACES)

INCLUDED ACCESSORIES & SERVICES

4 ZONE SCR CONTROL WITH INDEPENDENT PID LOOPS
 HONEYWELL HC900 MULTIZONE CONTROL WITH DATA LOGGER
 HONEYWELL UDC2500 OVERTEMPERATURE CONTROL
 LOT CALIBRATED THERMOCOUPLES WITH CERTIFICATION
 INSTRUMENT CALIBRATION WITH CERTIFICATION
 (4) 1" NPT UNIFORMITY SURVEY PORTS AT EACH CORNER OF THE FURNACE
 1875°F AIR COOLED FAN
 3 DAY START UP SERVICE WITHIN THE CONTINENTAL USA
 PNEUMATIC OR ELECTRIC VERTICAL DOOR OPERATION
 PNEUMATIC CLAMPS ON EACH CORNER OF THE DOOR FOR THE FNA SERIES
 TRIPLE SEAL DOOR GASKET FOR THE FNA SERIES DOOR

OPTIONAL ACCESSORIES & SERVICES

CAST ALLOY HEARTH
 AGITATED QUENCH TANKS WITH OR WITHOUT ELEVATORS
 ADDITIONAL ZONE CONTROL UP TO 16 ZONES
 INDIVIDUALLY CALIBRATED THERMOCOUPLES
 TYPE S THERMOCOUPLES OR TYPE N THERMOCOUPLES
 UPGRADED INSULATION FOR 2190 °F / 1200 °C OPERATION
 2200°F (1200°C) WATER COOLED FAN
 REFERENCE PORTS WITHIN 3" OF CONTROL POINTS
 IN HOUSE TESTING INCLUDING FURNACE PROFILE (UP TO 24 POINTS)
 IN HOUSE CERTIFICATION BY OUTSIDE CONTRACTOR (UP TO 24 POINTS)
 ATMOSPHERE SEALED CASE AND INERT FLOW PANEL
 THERMOCOUPLE JACK PANEL (FOR WORK THERMOCOUPLES)
 INTERNATIONAL START UP SERVICE

AMS-2750D SPECIFICATION

AMS Revision D allows for several classes of equipment. The class 1 equipment calls for a temperature uniformity requirement of $\pm 5^\circ\text{F}$. There are also specifications for calibrated thermocouples and standard instrument accuracy. Class 2 requires $\pm 10^\circ\text{F}$ and same system requirements. Refer to page 11 of the AMS-2750D for complete list of classification.

Class A instrumentation calls for each zone to have an independent control thermocouple. Each zone must be recorded by a recording instrument. Two additional recording sensors in each control zone located to best represent the hot and cold points in the oven based on the most recent survey. L&L accommodates this by having one thermocouple port located at each corner of the oven. Refer to page 12 of AMS-2750D for complete information on instrumentation.

The survey interval is specified in tables 8 and 9 of AMS-2750D. The required minimum number of sensors is specified in table 11 of AMS-2750D. Type, quantity and location of thermocouples will have an impact on the frequency of calibration and testing. Optional type N thermocouples do not drift like type K and may not require monthly calibration.

L&L aircraft grade furnaces are capable of meeting the requirements as specified in AMS-2750D, Boeing BAC5621, Airbus Industries 01-03-12, 01-03-17, 01-03-18, Rolls Royce 70-00-00-300-711, 70-49-01-370-002, 70-49-11-370-004.

