# THERMCRAFT THERMAL PROCESSING EQUIPMENT

Thermcraft designs, manufactures, and markets high-quality custom and standard industrial and laboratory heaters, ovens and furnaces. Our products include: a wide range of heating elements, custom furnaces, recirculating ovens, tube furnaces, box furnaces, high temperature heaters, diffusion furnace heaters along with electronic temperature sensors and controls, vacuum formed insulation and vacuum formed ceramic fiber heaters. Thermcraft's products are utilized worldwide in various industries, including Chemical Vapor Deposition, Crystal Growing, Nanotechnology, Heat Treating, Metal Treating, Ceramics, Wire, Glass, Chemical, Nuclear, R&D/Laboratory and Universities, Aerospace, Pharmaceutical, Government, Military, Solar, and the Semiconductor Industry

**Thermcraft manufactures a complete line of high quality thermal processing equipment:**

- Furnaces
- Ovens
- Express-Line Laboratory Furnaces
- Transparent Tube Furnaces
- High Temperature Heaters and Insulation
- Semiconductor Heating Elements
- Materials Testing Furnaces and Ovens
- Control Systems
- Parts and Service

SINCE 1971

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# CAPABILITIES CATALOG

**A Recognized Leader in Custom Heat-Treating, Industrial and Laboratory Ovens and Furnaces**

# CUSTOM DESIGNED FURNACES

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In addition to standard designs, we can also supply equipment built to your specifications. Thermcraft's engineers can take your process requirement and suggest the most appropriate type of furnace design. Furnaces can also be supplied with material load-unload manipulators or various vibrating or auger-type material feed equipment. Designs are available in temperature ranges up to 1700 °C (3092 °F) in air or higher with inert atmospheres.

## Rotary Tube Furnace

Rotary Tube Furnaces. Temperatures up to 1700 °C for use with High temperature alloy or ceramic tubes. Cooling zones also available along with drive systems and controls.

## Manipulator Box Furnace

Front loading box furnace with automatic coil load-unload handling equipment for operation at temperatures up to 1204 °C (2200 °F).

# CUSTOM DESIGNED FURNACES

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## Bottom Load Elevator Hearth Furnace

This Bottom Loading Elevator Hearth Furnace has a hydrogen atmosphere system. Dual crucibles on each side are used to control the cool-down rate of the parts.

## Car Bottom Furnace

This car bottom furnace is designed for maximum throughput. Three temperature zones have a combined 180 kW power rating. The heated chamber is 44" W x 20" H x 192" L and can reach a maximum temperature of 982 °C (1800 °F).

# CUSTOM DESIGNED FURNACES

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## Long Tube Furnace

Heated chamber: 24″ ID x 96″ long. Available in single or multi-zone configurations, can be mounted horizontally or vertically. Temperature ranges 1000 °C-1700 °C.

## Industrial Box Furnace

With a heated chamber of 72″ high x 72″ wide x 216″ deep. Furnace rated for 1010 °C (1850 °F) maximum operating temperature. Water cooled paddle wheel fans provide maximum temperature uniformity.

# CVD SYNTHESIS

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## Vertical Bridgman Crystal Growing Furnace

Furnace system is completely self-contained in this compact arrangement. Furnace translation is controlled by geared stepper motor for infinite speed control. Furnace base supports process tube and allows for rotation of tube.

## Gradient Freeze Crystal Growing Furnace

Mounted on a base that allows the furnace to be easily moved from horizontal to vertical operation. The base contains control system to form a compact unit. For 1300 °C (2372 °F) operating temperatures. Usable heated chamber: 4″ ID x 36″ long.

## Horizontal Bridgman Crystal Furnace

System is designed with geared stepper motors for infinite control of furnace movement. Furnace has multiple zones with quadrant control in the spike zone. Top safety enclosure covers complete furnace assembly.


## TransTemp CVD

Custom transparent tube furnaces for novel laboratory and industrial applications and manufacturing environments with heating chamber temperature capacities of up to 1000 °C (1832 °F).

# CUSTOM DESIGNED FURNACES

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Should say 24" wide hearth.

## Dual Chamber Front Load Furnace

Two zone with 48~~" diameter~~ hearth and 12" high usable heated chamber. 1100 °C (2012 °F) maximum operating temperature.

## High Temperature Box Furnace

Bench-top or floor-standing box furnace with control system designed for laboratory and industrial use. Temperature range to 1200 °C (2200 °F).If specified using Silicone Carbide heating elements for operating temperatures up to 1538 °C (2800 °F). Side swinging  door allows easy access.

## Large Box Furnace with Lifting Door

Usable heated chamber: 60" high x 60" wide x 60" long. Temperatures up to 1500 °C (2732 °F)

# eXPRESS-LINE LAB FURNACES

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## eXPRESS-LINE Protégé Compact Split Tube Furnace

Integrated control system. Temperatures to 1100 °C (2012 °F)

## eXPRESS-LINE Box Furnace

Temperatures to 1200 °C (2192 °F) with vertical lift door.

## eXPRESS-LINE XSB Ashing Furnace

Designed to provide ideal conditions for complete combustion of test samples. Temperatures up to 1100 °C (2012 °F).  Smart Control offers profile programming, data acquisition, and communications.

## eXPRESS-LINE High Temp Furnace

Standard box furnace with temperature ratings up to 1800 °C (3272 °F).

# CUSTOM DESIGNED OVENS

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## Table Top Shelf Oven

With programmable temperature controllers for variable temperatures up to 650 °C (1200 °F). Also available with adjustable shelves.

## Controlled Temperature Box Oven

With heated chamber 78½" high x 72" wide x 120" deep. Forced air recirculating system with maximum operating temperature of 260 °C (500 °F).

## Multdoor Recirculating Oven

Custom designed for special application in the aerospace industry. Multiple heated chambers with individual doors minimizes heat loss during changeovers. Heated chamber: 60" high x 120" wide x 60" deep. For temperatures up to 400 °C (752 °F).

# CUSTOM DESIGNED OVENS

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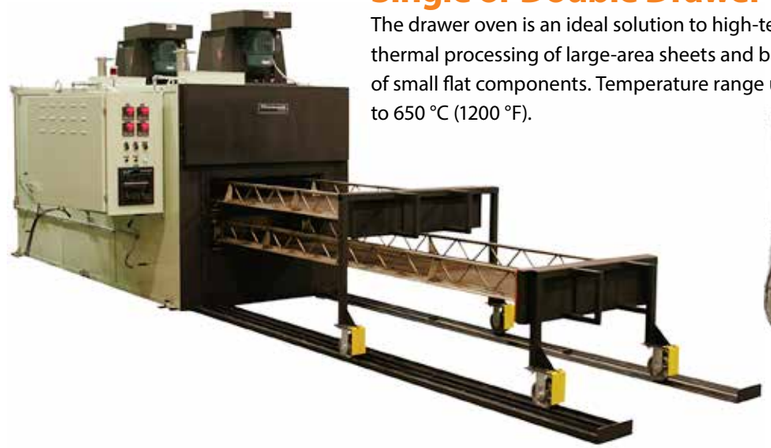

## Single or Double Drawer Oven

The drawer oven is an ideal solution to high-temperature thermal processing of large-area sheets and batches of small flat components. Temperature range up to 650 °C (1200 °F).

## Industrial Vertical Split Oven

For low temperature operations. Temperature range up to 300 °C (572 °F).

## Conveyor Oven

A conveyor oven is designed for the rapid heat treatment of products in various manufacturing environments. Designed for fast drying and curing of products. Temperature range up to 650 °C (1200 °F).

# TUBE FURNACES

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## eXPRESS-LINE Split Tube Furnace

ID ranges from 3" to 6" from 12" to 36" long heated lengths. Up to three zone configuration. Includes touchscreen SmartControl.

## Hinged Split Tube Furnace

With Silicon Carbide elements for temperatures up to 1538 °C (2800 °F). Designed for vertical or horizontal operation.

## Customized Vertical Split Tube Furnace

With 3" ID x 24" long heated chamber.
Up to three zone configuration.
Temperatures to 1204 °C (2200 °F).

## Rotary Tube Furnace

complete with variable speed control and temperature control system.

## ExpressLine Solid Tube Furnace

Available in 1" to 3.75" ID up to 24" long.
Includes touchscreen SmartControl.

# MARSHALL FURNACES

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## Marshall Furnace Shunt Tap Operation

Operating temperatures from
1100 °C (2012 °F) to 1700 °C (3092 °F)
Universal positioning. Many sizes available.

The number of shunts required is usually determined by the length of the uniform temperature zone and the temperature variation allowable. By placing a suitable length of resistance wire from one shunt tap to another, a parallel circuit is created, reducing the amount of current through the windings at this point. The amount of current bypassed will depend on the amount of resistance wire used.

# TRANSTEMP FURNACES

## TransTemp Furnaces

TransTemp Furnaces made exclusively by Thermcraft make it possible to see inside the furnace. TransTemp transparent furnaces use a gold mirror that reflects infrared radiation and acts as an insulator. With a Maximum Operating Temperature of 1000 °C, these furnaces allow the heated sample to be observed which yields much more information. Using the gold mirror as the only insulation allows the furnace to be much more responsive to heat up and cool down ie. Rapid Cycle times.

# DIFFUSION FURNACE ELEMENTS

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## FIBERCRAFT™

### FC-200

**Low Mass Elements**

For
- Low Temperature Operation
- Rapid Thermal Response

Ideal for LPCVD and thin oxidation processes, the Fibercraft FC-200 provides fast recovery and rapid cool down rates. These low-mass elements give you repeatable performance . Unique thermal engineering is used to increase the radiating surface, extending element lifetime.

LPCVD (Low Pressure Chemical Vapor Deposition)
Available with heater surfaces coated black.

### FC-200L

**Low Mass Elements**

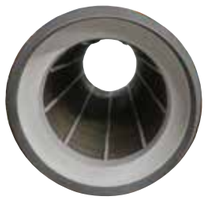
For
- Low Temperature Operation
- Rapid Thermal Response
- Longer life

The FC-200L offers all the properties of the FC-200 combined with the additional features of powdered metal wire to provide longer life.

Improved lifetime for LPCVD and thin oxidation processes.

Available with heater surfaces coated black.

## DURACRAFT™

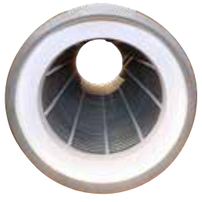


### DC-1300

**Furnace Elements**

For
- Cost-Effective High Temperature Operation

The advanced thermal engineering of the DC-1300 furnace elements provide dependable performance at the lowest cost. Power is balanced between center and end zones, providing precise temperature uniformity at varied operating temperatures while reducing heat loss.
For all high temperature processes including silicon nitride and HTO LPCVD, oxidation, annealing, and drive-in. Ideal for horizontal furnace retrofits.

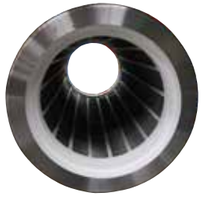


### DC-1300Plus

**Furnace Elements**

For
- High Temperature Operation
- Improved performance for temperature cycling

Addition of self locking spacers to the DC-1300 design allow the DC-1300Plus furnace elements to provide consistent, reliable operation throughout the fluctuations of repeated temperature cycling.
Ideal for all high temperature processes including silicon nitride and HTO LPCVD, oxidation, annealing, and drive-in.



### DCHT-500

**Furnace Elements**

For
- High Temperature Operation
- Large Temperature Swings
- Longest Life

DCHT-500 furnace elements deliver dependable performance and long life even at the highest processing temperatures . Self-locking spacers and superior element design reduce the possibility for element sag. Like the DC1300, power is balanced between center and end zones , providing precise temperature uniformity at varied temperatures while reducing heat loss. The DCHT-500 includes heavy gauge, powdered-metal heating wire for the longest lite available.

The DCHT-500 is a must for well drive, field oxidation, LOCOS, and other long, high-temperature processes.

# LAB-TEMP OVENS & FURNACES

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## LAB-TEMP™

**Ovens and Furnaces for Laboratories and Materials Testing Systems**
Polished Stainless Steel Cabinetry with Custom Test Frame and Load Cell Chambers -185 °C (-300 °F) to 1704 °C (3100 °F)

### Laboratory Oven

- Long life heating elements
- Wide temperature range: -185°C to 425°C (-300 °F to 800 °F)
- Recirculating blower for excellent temperature uniformity
- Sturdy external and internal welded stainless steel shells
- High quality fiberglass and mineral insulation
- Tight, resilient fiberglass seal
- Latch lock for quick access


### Vertical Solid Tube Furnaces

- Up to 1700 °C (3092 °F) Operation
- Molybdenum Disilicide Elements
- Note: exterior shape will change at temperature rating above 1200°C

### Solid Or Split Tube Furnaces

- Up to 1204 °C (2200 °F) Ceramic Embedded Heating Elements
- Vertical or Horizontal Orientation
- Stands Available Separately

### High Temperature Vertical Split Tube Furnace

- Up to 1700 °C (3092 °F) Operation
- Molybdenum Disilicide Elements
- Note: exterior shape will change at temperature rating above 1200°C

### Environmental Chamber

- Temperatures from -185 °C (-300 °F) to 570 °C (1150 °F)
- Recirculating Blower for Excellent Temperature Uniformity

# CONTROL SYSTEMS

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**A variety of control systems are available.** Some simply heat and hold the furnace at one temperature indefinitely, while others are more complex programmable systems. A programmer, rather than a simple controller, will be necessary if controlling the rate of heating, cooling or holding time at any one temperature is required.

**Overtemperature Protection -** An independent overtemperature protection system is optional. It is designed to protect expensive heating systems or valuable furnace contents. The adjustability of the limiting temperature means the system may be set to protect either the furnace itself, or at a lower temperature, the valuable load inside.

## Combination Panel

Temperature and Atmosphere Control Panel

Multiple Zone Control using Individual Temperature Controls, PLC, or Industrial PC Controls allow local or remote control, data collection, communications, and monitoring.

## Control Panel with PLC & Touchscreen HMI

Allows for manual programmable furnace control or for automatic programming using Thermcraft's exclusive software package. The software package permits complete programmed furnace temperature control as well as control of linear furnace speed and acceleration.

# HIGH TEMPERATURE HEATERS

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**Thermcraft high temperature ceramic heaters are available in temperature ranges from 1010 °C (1850 °F) to 1204 °C (2200 °F). Both flat plate and cylindrical types are offered and can be customized to meet your specifications.**

## 2 Semi-Cylindrical Ceramic Heaters

Paired to Make a Full Cylinder

## Ceramic Heater

With Insulation Package

## Semi-Cylindrical Ceramic Heater

With Embedded Coils

## Flat Plate Ceramic Heater

With Embedded Coils

## 4 Flat Plate Ceramic Heaters

2 Flanged, 2 Non-Flanged Joined Together

## Plug Heater

Thermcraft has the capability to manufacture or rebuild most air heaters used in recirculating ovens.

# FIBERCRAFT™ CERAMIC HEATERS

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Fibercraft vacuum formed ceramic fiber heaters have the heating element and insulation together in one complete unit. The heaters are produced using high quality, high purity, vacuum formed ceramic fiber with a low sodium inorganic bond. Available in cylindrical, semi--cylindrical and flat plate types in temperature ranges from 1100 °C (2012 °F) to 1200 °C (2192 °F).

## Fibercraft® Semi-cylindrical Heater with Vestibule

Standard and Custom Plate Heaters

## Fibercraft® Flanged Flat Plate Heater

Standard and Custom Plate Heaters

## 2 Semi-Cylindrical Fibercraft® Heaters

Paired To Make A Full Cylinder.

## Fibercraft® Flat Plate Heater

Standard and Custom Plate Heaters

## Full Cylinder Fibercraft

Standard and Custom Full Cylinder Heaters

# INSULATION

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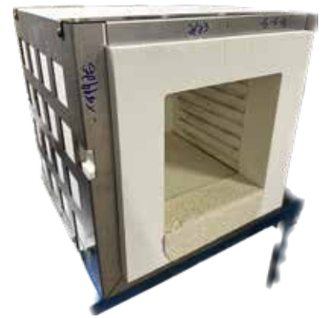

## Flat Plate Fiber Heaters

Board Insulated Box Unit

## Fibercraft® Moistened Formable Insulation

Formable Insulation

## Insulation Disks

Manufactured to Fit Specialized Applications

## Insulation With Vestibule

Manufactured to Fit Specialized Applications

## Fibercraft® Board Insulation

Compatible with All Flat Plate Heaters

## Insulation Package Without Vestibule

Manufactured to Fit Specialized Applications

# DIFFUSION COLLARS AND DISKS

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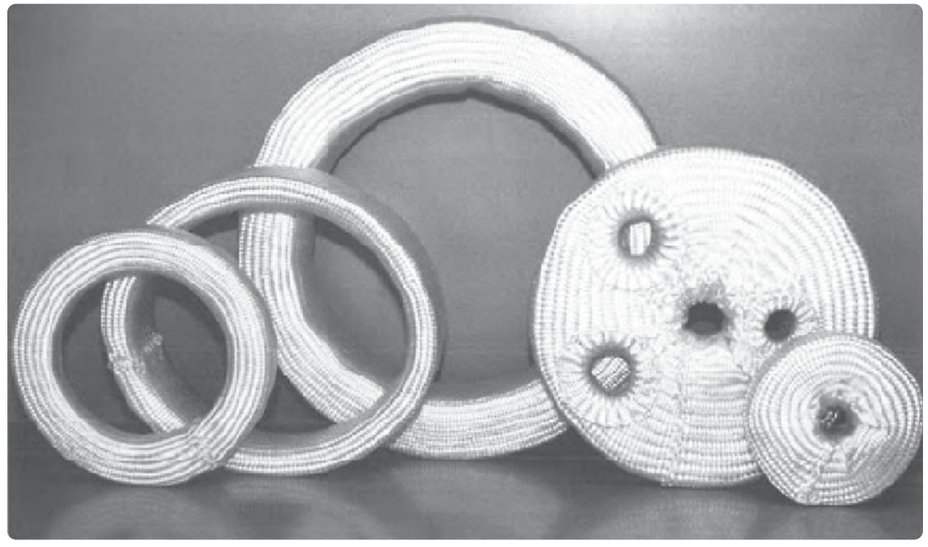

- **Eliminate Loose Packing**
- **Reduce Downtime**
- **Shorten Profiling Times**
- **Reduce Energy Loss**
- **Speed Tube Changes**
- **Reduce Contamination**
- **Increase Productivity**
- **Increase Reliability**

Collars and disc are made of ceramic fiber insulation packed into braided silica, formed and sized to customer specifications. The collars provide clean and easy-to-handle insulation at the load end while disks offer the same advantages at the source end of the furnace.

## How to order:

**Collars:**
Collars are available for temperature ranges up to 1100 °C.
Specify which range you require when ordering and indicate the following:
- Outside diameter of diffusion process tube
- Diameter of hole in vestibule block

**Discs:**
Indicate the following when ordering:
- Diameter of hole in vestibule block (or outside diameter of disc)
- Diameter of center hole

# VESTIBULE BLOCKS

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- **Top Quality**
- **Competitive Prices**
- **Prompt Delivery**
- **Custom Made to Customer Specifications**

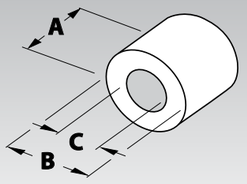
Thermcraft's vestibule blocks and insulation tubes - are manufactured from high quality, high purity, vacuum formed ceramic fiber with a low sodium inorganic bond. Made to customer specification, these are available to fit all diffusion furnaces and specialty insulation applications.

Stepped or straight blocks are available for either load or source end.

## How to order:

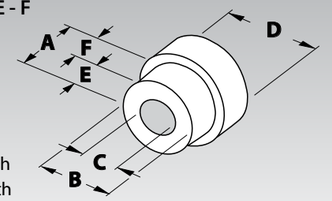
**Straight**
**VB - A - B - C**

**A** = Length
**B** = O.D.
**C** = I.D.




**Stepped**
**VB - A - B - C - D - E - F**

**A** = Overall Length
**B** = Small O.D.
**C** = I.D.
**D** = Large O.D.
**E** = Small O.D. Length
**F** = Large O.D. Length




Order 4-1/4" I.D. Blocks for 100 mm outside diameter quartz tubes
Order 5-3/4" I.D. Blocks for 141 mm outside diameter quartz tubes
Inside diameters are available in 1/8" increments.
Eccentric I.D. blocks are also available