CM FURNACES

The Future of HIGH TEMPERATURE PRODUCTION FURNACES

Research and Development

Research and Development

Tube Furnace

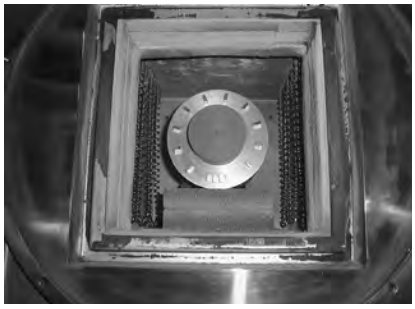
RESEARCH

Powder Reduction

Brazing

APPLICATIONS

P/M



Box Furnace

MATERIALS

CIM

MIM

TESTING

Pusher Furnace

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Custom Design

Quality Technical Assistance

Customer Site Service and Repair

CM Furnaces, Inc.
103 Dewey Street, Bloomfield, NJ 07003
Phone; (973) 338-6500 • Fax: (973) 338-1625
E-Mail Address: info@cmfurnaces.com
World Wide Website: www.cmfurnaces.com

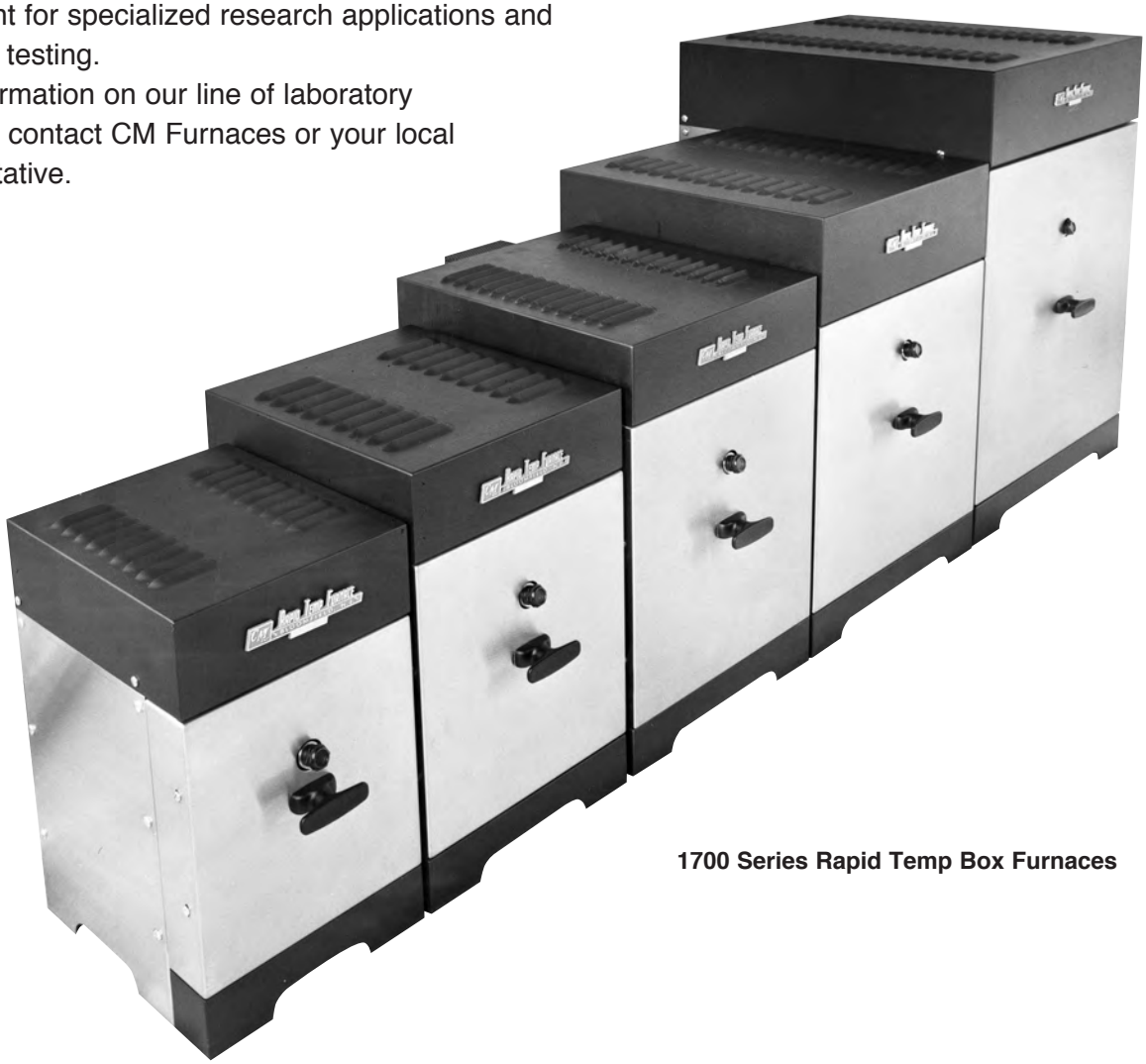
2 INTRODUCTION

CM Furnaces was established in 1946 and has been known for state of the art design and manufacturing of all types of air, hydrogen and inert atmosphere electric furnaces. Though many of our furnaces are of standard design and construction, CM has specialized in furnaces for a variety of applications or to update standard equipment to specific needs.

Use the chart on the next page to find the right CM furnace for your requirements. Individual model specifications are found at the end of each section.

In addition to our industrial line of furnaces, CM manufactures a complete line of highly sophisticated research and laboratory equipment. It includes Combustion Tube furnaces, our **Rapid Temp** line of box and tube furnaces (to 1800°C), Platinum Tube furnaces and a variety of equipment for specialized research applications and materials testing.

For information on our line of laboratory furnaces, contact CM Furnaces or your local representative.



1700 Series Rapid Temp Box Furnaces

FURNACE PRODUCT GUIDE 3

CONTINUOUS FURNACES

SERIES	OPERATING TEMP.	MAX. TEMP.	ATMOSPHERES	HEATING ELEMENT	INTERNAL CONFIGURATION	MODE OF OPERATION	TYPICAL APPLICATIONS	SECTION
300 SERIES	TO 1700°C	1800°C	REDUCING INERT	MOLYBDENUM WIRE	ROUND AND D-SHAPE MUFFLE	MANUAL EXTERNAL STOKER PUSHER	METALLIZING SINTERING ANNEALING CO-FIRING	4
400 SERIES	TO 21OO°C	2200°C	REDUCING INERT	TUNGSTEN OR MOLYBDENUM HAIRPIN/ROD	OPEN CAVITY	MANUAL EXTERNAL STOKER PUSHER	METALLIZING SINTERING ANNEALING CO-FIRING	6
500 SERIES	TO 1150°C	1200°C	REDUCING INERT	SILICON CARBIDE	METALLIC MUFFLE	MANUAL EXTERNAL STOKER HUMPBACK BELT PUSHER	BRAZING BRIGHT FIRING SINTERING HEAT TREATING	9
600 SERIES	TO 1150°C	1200°C	REDUCING INERT	NICKEL CHROME KANTHAL A1++	METALLIC MUFFLE	MANUAL EXTERNAL STOKER HUMPBACK BELT PUSHER	BRAZING BRIGHT FIRING SINTERING HEAT TREATING	9
700 SINTERING SERIES	TO 1700°C	1700°'C	AIR INERT+	KANTHAL 1800++ KANTHAL 1700++ SILICON CARBIDE	CERAMIC MUFFLE OPEN CAVITY	MANUAL EXTERNAL STOKER PUSHER	ANNEALING	11

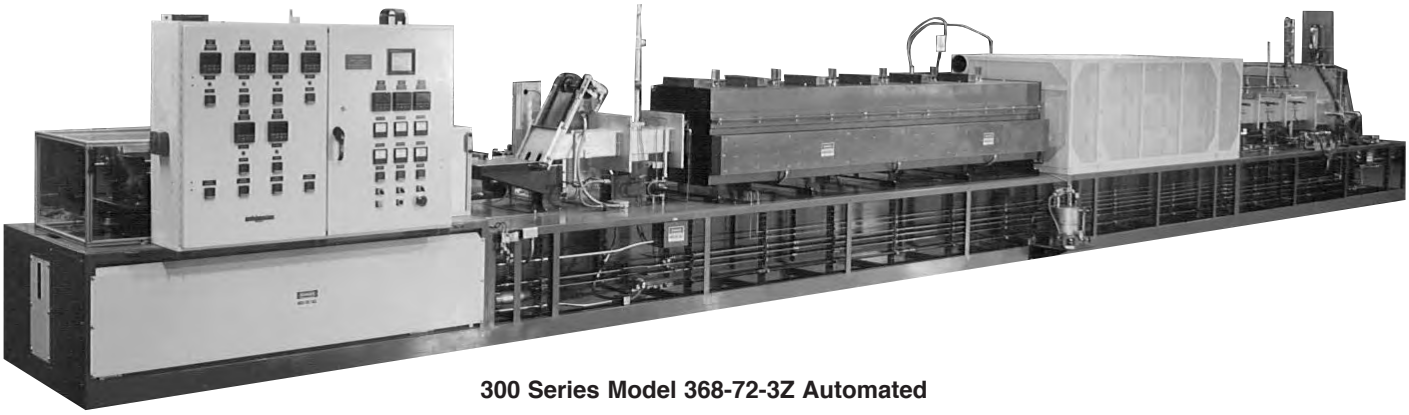
PERIODIC FURNACES

2300 SERIES	TO 1300°C	1300°C	AIR INERT	NICKEL CHROME KANTHAL A1 ++ KANTHAL APM	BOX TYPE HORIZONTAL OR VERTICAL TUBE	FRONT LOADING BOTTOM LOADING	BRAZING HEAT TREATING ANNEALING	14
2800 SERIES	TO 1550°C	1550°C	AIR INERT+	SILICON CARBIDE	BOX TYPE HORIZONTAL OR VERTICAL TUBE	FRONT LOADING BOTTOM LOADING	SINTERING HEAT TREATING CRYSTAL GROWTH MELTING	14
2900 SERIES	TO 1600°C	1600°C	AIR INERT+	KANTHAL 1700++	BOX TYPE HORIZONTAL OR VERTICAL TUBE	FRONT LOADING BOTTOM LOADING	SINTERING HEAT TREATING CRYSTAL GROWTH MELTING	14
3100 SERIES	TO 1700°C	1700°C	AIR INERT+	KANTHAL 1800++	BOX TYPE HORIZONTAL OR VERTICAL TUBE	FRONT LOADING BOTTOM LOADING	SINTERING HEAT TREATING CRYSTAL GROWTH MELTING	14
3300 SERIES	TO 1800°C	1800°C	AIR INERT+	KANTHAL 1900++	BOX TYPE HORIZONTAL OR VERTICAL TUBE	FRONT LOADING BOTTOM LOADING	SINTERING HEAT TREATING CRYSTAL GROWTH MELTING	19
1500 SERIES	TO 1700°C	1700°C	REDUCING	MOLYBDENUM	BOX TYPE	FRONT LOADING BOTTOM LOADING	SINTERING METALLIZING CO-FIRING ANNEALING	14

+ WILL LOWER MAXIMUM OPERATING TEMPERATURE ++ TRADEMARK KANTHAL CORPORATION

4 300 SERIES

HIGH TEMPERATURE MOLYWOUND MUFFLE FURNACES TO 1800°C



300 Series Model 368-72-3Z Automated

GENERAL DESCRIPTION

CM's "300 Series" molybdenum wound muffle, high temperature atmosphere furnaces have been engineered for use in the fields of sintering of both metals and ceramic systems, the metallizing of various ceramic bodies, such as aluminum oxide and beryllium oxide, and the co-firing of ceramic-metallized systems. "300 Series" furnaces are extensively used in the annealing and sintering of rare and common metals, such as tungsten and molybdenum, and special applications, such as the processing of nuclear fuels and heat treating of special alloys. They also service high temperature sintering of powdered metals and metal injection molding.

The normal operating temperatures are from 800°C to 1700°C in reducing atmospheres. All furnaces are constructed of heavy gauge steel welded and reinforced. CM furnaces are factory pretested and ready for immediate installation. Atmosphere, water and electricity are the only necessary services required for operation. All CM muffle furnaces are designed to provide the customer with a neat, compact, highly engineered unit providing maximum versatility.

MUFFLE-HEATING ELEMENT

CM's "300 Series" furnaces employ a molybdenum wound muffle heating element. This consists of a pure aluminum oxide muffle tube structurally designed to withstand operating temperatures up to 1800°C. Pure molybdenum wire (CM Mo-400) specially processed to our specifications is then wound (employing a variable pitch technique) directly on the aluminum oxide core. This variable pitch is graduated to produce maximum temperature uniformity throughout the heat zone. The winding is then set in place with a high purity aluminum oxide protective insulating coating, thus minimizing the possibility for electrical shorting between turns. The entire structure is cured prior to installation in the furnace case.

ENTRANCE AND COOLING SECTIONS

The length of the entrance sections is normally specified in accordance with processing requirements and is available with optional preheat sections, binder removal sections and gas curtains. Cooling sections are fully water jacketed, individually controlled and feature heavy duty steel construction.

DOORS AND END SECTIONS

CM doors are safety type, resting against an inclined end plate by gravity. Mating surfaces are ground to minimize atmosphere loss. When opened, doors automatically activate the protective atmosphere flush via microswitches and solenoid valves. Doors are counterbalanced, easily activated and open automatically to relieve excessive gas pressures.

300 SERIES 5

HIGH TEMPERATURE MOLYWOUND MUFFLE FURNACES TO 1800°C

ATMOSPHERE

Hydrogen, dissociated ammonia, forming gas or any other reducing atmospheres compatible with refractory metal heating elements can be employed. Idle flow rate of consumption will vary between 25 and 100 SCFH processing atmosphere depending on furnace size. Momentary flush flow rates are approximately 250-1500 SCFH depending on furnace opening. The standard CM gas panel includes all necessary pressure regulators, flow meters, switching solenoids and pressure switches for both primary processing atmosphere and standby safety nitrogen. CM refractory metal heating element furnace systems are suitable for operation over a wide range of dew points when incorporating a Model H258 humidifier.

SAFETY

All CM muffle hydrogen atmosphere furnaces come complete with CM's Hydrogen Safety System. This safety system features a touchscreen controlled PLC which monitors the operating parameters of the furnace at all times. This prevents the unsafe operation of equipment in the event of any service failure. In case of primary pressure malfunction, power to the heating element is automatically turned off and processing atmosphere is switched to stand-by protective atmosphere causing activation of both visible and audible alarms. In case of momentary power failure, all equipment is provided with an automatic reset. Extended power failure automatically transfers processing gas to stand-by atmosphere and requires manual reset of both gas and electric services.

TEMPERATURE CONTROL

Standard instrumentation consists of microprocessor based set point controllers operating in conjunction with Type C (tungsten 5% rhenium vs. tungsten 26% rhenium) thermocouples. Controls and recording instrumentation are available from all leading instrument manufacturers. **Separate variable set point independent overtemperature instrumentation is standard.**

POWER SUPPLIES

Various power supplies of appropriate ratings are available depending upon furnace size and process requirements. Silicon-controlled rectifiers (SCR) with current limiting are provided on all furnace systems.
Ratings: 5 to 100 KVA.
Voltage: To meet customer requirements.
Single or three phase 50/60 Hz.

ACCESSORIES

Preheat Binder/Wax Removal
Humidification Equipment
Dew Point and Oxygen Monitors
Recording Instrumentation
Electronic Ignitors
Profiling Equipment

GENERAL SPECIFICATIONS

Normal Operating Temperature Range: 800°C - 1700°C
Maximum Continuous Operating Temperature:1800°C
Muffle Length: 24", 30", 36", 48", 60", 72"
No. of Zones: 1, 3, 6

300 Series Model 344-36-3Z Manual

6 400 SERIES

OPEN ELEMENT FURNACES to 2200°C

GENERAL DESCRIPTION

CM's "400 Series" high temperature open element atmosphere furnaces have been developed and engineered to provide maximum versatility and production capability at elevated temperatures. Two (2) basic furnace systems are available. The 400A Series furnace design incorporates exposed refractory metal heating elements contained within a pure aluminum oxide refractory brick hearth. The 400Z Series furnace employs the same basic type of construction using tungsten rod heating elements rigidly supported within a zirconium oxide refractory brick system. In both the A and Z models, the heating elements are housed within their own area. The floor is constructed using high purity aluminum oxide or zirconium oxide sections which permit the continuous processing of heavy loads. In the case of the 400Z model furnaces, an isolating buffer zone is incorporated between the zirconium oxide hearth and the outer aluminum oxide network to minimize any possible interaction between the two ceramic systems. The normal operating temperature of Model 400A is between 800°C and 1700°C with custom insulating systems to 1880°C. The structural character of the brick permits the processing of larger and heavier workloads than "300 Series" furnaces. The CM 400Z model furnaces are capable of continuous operating temperatures up to 2100°C with intermittent capabilities to 2200°C. The CM "400 Series" furnaces are primarily used for the processing of a wide variety of metals and ceramics in atmospheres ranging from 60% hydrogen - 40% nitrogen to pure hydrogen for non-oxides. Normal operating dew points are from approximately -60ºC to +50°C. Typical uses involve general high temperature experimental work, metallizing, co-firing and the processing of such metals as tungsten, molybdenum, niobium, rhenium, nickel, palladium, zirconium, nuclear fuels, high temperature sintering of powder metals, metal injection molding and special alloys, intermetallics and non-oxide components.

HEAT ZONE

CM "400 Series" furnaces are supplied in a variety of sizes with standard heat zones varying between 24" and 225" in length. The heating elements consist of refractory metal rigidly supported within the zirconia or alumina refractory hearth network.

400 Series Model 4912A-96-42 Automated

ENTRANCE AND COOLING SECTIONS

The length of the entrance sections are normally specified in accordance with processing requirements and are available with optional preheat sections, binder removal sections and gas curtains. Cooling sections are fully water jacketed, individually controlled and feature heavy duty steel construction.

DOORS AND END SECTIONS

CM doors are safety type, resting against an inclined end plate by gravity. Mating surfaces are ground to minimize atmosphere loss. When opened, doors automatically activate the protective atmosphere flush via microswitches and solenoid valves. Doors are counterbalanced, easily activated and open automatically to relieve excessive gas pressures.

ATMOSPHERE

Hydrogen, dissociated ammonia, forming gas or any other reducing atmospheres compatible with refractory metal heating elements can be employed. Idle flow rate of consumption will vary between 25 and 100 SCFH processing atmosphere depending on furnace size. Momentary flush flow rates are approximately 250-3000 SCFH depending on furnace opening. The standard CM gas panel includes all necessary pressure regulators, flow meters, switching solenoids and pressure switches for both primary processing atmosphere and standby safety nitrogen. CM refractory metal heating element furnace systems are suitable for operation over a wide range of dew points when incorporating a Model H258 humidifier.

SAFETY

All CM hydrogen atmosphere furnaces come complete with CM's Hydrogen Safety System. This safety system features a touchscreen controlled PLC which monitors the operating parameters of the furnace at all times. This prevents the unsafe operation of equipment in the event of any service failure. In case of primary pressure malfunction, power to the heating element is automatically turned off and processing atmosphere is switched to stand-by protective atmosphere causing activation of both visible and audible alarms. In case of momentary power failure all equipment is provided with an automatic reset. Extended power failure automatically transfers processing gas to standby atmosphere and requires manual reset of both gas and electric services.

TEMPERATURE CONTROL

Standard instrumentation consists of microprocessor based set point controllers operating in conjunction with Type C (tungsten 5% rhenium vs. tungsten 26% rhenium) thermocouples. Controls and recording instrumentation are available from all leading instrument manufacturers.

Separate variable set point independent overtemperature instrumentation is standard.

POWER SUPPLIES

Various power supplies are available at appropriate ratings depending upon furnace size and process requirements. Silicon-controlled rectifiers (SCR) with current limiting are provided on all furnace systems.
Voltage: To meet customer requirements
Single or three phase 50/60 Hz.

ACCESSORIES

Preheat Binder/Wax Removal
Humidification Equipment
Dew Point and Oxygen Monitors
Recording Instrumentation
Electronic Ignitors
Profiling Equipment

GENERAL SPECIFICATIONS

400A Series
Normal Operating Temperature: 800°C to 1700°C
Maximum Operating Temperature: (Optional) 1880°C
Atmosphere: Reducing (Inert optional, consult factory)
Heating Elements: Molybdenum and/or Tungsten depending upon customer application
400Z Series
Normal Operating Temperature: 800°C to 2100°C
Maximum Operating Temperature: 2200°C

400 Series Model 41010

8 SPECIFICATIONS

300 SERIES

ROUND*				ARCH				AUTOMATION	
MODEL NO.	ID	HEATED LENGTH	NUMBER OF ZONES	MODEL NO.	HEATED OPENING HxW (INCHES)	HEATED LENGTH (INCHES)	NUMBER OF ZONES	EXTERNAL STOKER	AUTOMATIC PUSHER
310	1”	30”	1	322	2”x2”	36”	1-3	•	*
315	1-1/2”	30”	1	333	3”x3”	36”	1-3	•	•
320	2”	36”	1-3	344	4”x4”	36”-48”	1-3	•	•
325	2-1/2”	36”	1-3	345	4-1/2”x5-1/2”	36”-72”	1-3	•	•
330	3”	36”	1-3	346	4”x6”	36”-72”	1-6	•	•
340	4”	36”	1-3	366	6”x6”	36”-72”	1-6	•	•
350	5”	36”	1-3	368	6”x8”	48”-72”	1-6	•	•
360	6”	48”	1-3					•	•

OPTIONS: Preheat sections single or multizone. Humidifier for wet or dry operation, nitrogen end curtains, dew point analyzers, recording instrumentation. *Automation not available with round construction.

400 SERIES

ALUMINA	ZIRCONIA				AUTOMATION	
MODEL NO.	MODEL NO.	FURNACE OPENING H x L (INCHES)	HEATED LENGTH INCHES	NO.OF ZONES	EXTERNAL STOKER	AUTOMATIC PUSHER
433A	433Z	3”x 3”	24” -36”	1-3	•	•
444A	444Z	4”x 4”	36”- 48”	1-3	•	•
446A	446Z	4”x 6”	36”- 48”	1-3	•	•
457A	457Z	5”x 7”	36”- 60”	1-6	•	•
466A	466Z	6”x 6”	48”- 60”	1-6	•	•
477A	477Z	7”x 7”	48”- 72”	1-6	•	•
448A	448Z	4”x 8”	60”- 84”	3-6	•	•
488A	488Z	8”x 8”	60”- 96”	3-6	•	•
499A	499Z	9”x 9”	60”- 72”	1-6	•	•
4612A	4612Z	6” x 12”	60”-144”	3-6	•	•
41010A	41010Z	10”x 10”	60”- 72”	1-6	•	•
41212A	41212Z	12” x 12”	60”- 96”	1-6	•	•
41616A	41616Z	16”x 16”	96 ”- 196”	3-6	•	•
42020A	42020Z	20”x 20”	96”- 196”	3-6	•	•

OPTIONS: Preheat sections single or multizone, humidifier for wet or dry operation, nitrogen end curtains, dew point analyzers, recording instrumentation.

***Additional sizes in both the 300 and 400 series are available**

ALLOY HEARTH ATMOSPHERE FURNACES to 1200°C

GENERAL DESCRIPTION

CM's line of nickel alloy muffle furnaces are designed for manual, belt or automatic pusher operation. Each unit has been engineered for years of trouble-free service in such applications as brazing, bright firing, annealing, heat treating and sintering. The belt furnaces are designed for low dew point applications utilizing humpback construction. CM also offers a line of small prototype belt furnaces for low volume production or R&D. They are available in a variety of heated lengths as well as with a combination of zones, atmosphere capability and optional control systems. Also CM equipment is designed as a complete package, factory pretested and ready for immediate installation.

HEATING ELEMENTS

CM belt furnaces employ heavy gauge sinuous wound nickel chrome alloy, iron based or silicon carbide heating elements depending upon customer preference and requirements. Low watt loadings are maintained to ensure maximum element life. All heating systems are designed for ease of replacement.

ENTRANCE AND COOLING SECTIONS

The length of the entrance sections is normally specified in accordance with processing requirements and is available with optional preheat sections, binder removal sections and gas curtains. Cooling sections feature heavy duty steel construction with various combinations of air and individually controlled water jacketed cooling zones.

CONSTRUCTION AND MAINTENANCE

All nickel alloy muffles are precision welded and leak tested to ensure maximum operating life. Normal construction is of a corrugated D-shaped design. The finest grade insulating brick and fiber materials are used to provide maximum muffle support, minimum heat loss and ease of maintenance. Interlocking insulation structure permits removal of the muffle through the top section of the furnace. The frame section of the furnace is constructed of heavy gauge steel with removable access panels. Atmosphere and drive controls can be located on the furnace or in a separate remote panel at the customer's option.

ATMOSPHERE

Single and multiple atmosphere systems are available including nitrogen, hydrogen, dissociated ammonia and various inert gases. The primary processing atmospheres flow through the furnace counter to the work being processed. Nitrogen end curtains are normally supplied on these systems.

SAFETY

All combustible atmosphere furnaces come complete with CM's Hydrogen Safety System. This safety system features a touchscreen controlled PLC which monitors the operating parameters of the furnace at all times. This prevents the unsafe operation of equipment in the event of any service failure. In case of primary pressure malfunction, processing atmosphere is switched to stand-by protective atmosphere causing activation of both visible and audible alarms. In case of momentary power failure, all equipment is provided with an automatic reset. Extended power failure automatically transfers processing gas to nitrogen and requires manual reset of both gas and electric services.

BELT AND DRIVE SYSTEMS

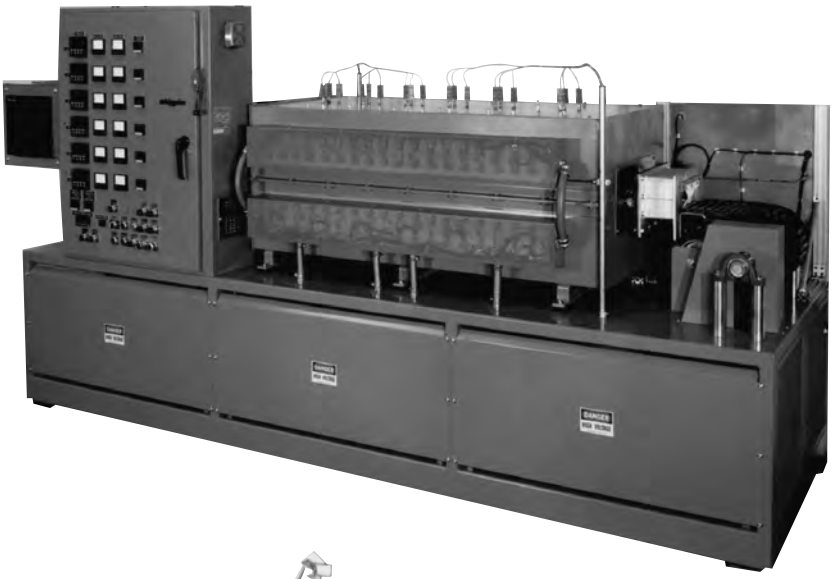
All CM drive systems employ variable speed solid state SCR power controllers. Rollers and drive components are designed to minimize friction and maintain belt alignment. Various alloy belts and mesh sizes are utilized depending upon process requirements, operating temperatures and atmosphere considerations.

TEMPERATURE CONTROL

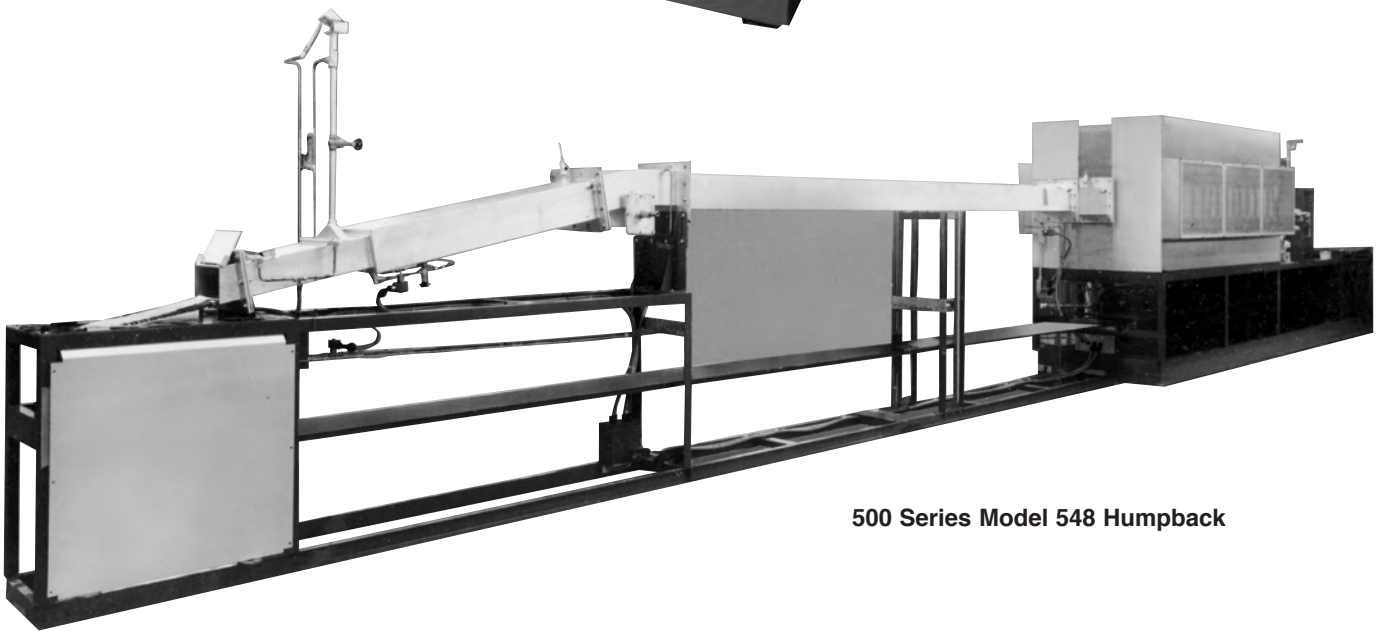
A wide variety of temperature control instrumentation is available from all leading manufacturers. Separate overtemperature instrumentation is provided on each control zone. Thermocouple type will depend upon process requirements. The control section can be located in a remote console or on the furnace at the customer's option.

10 500/600 SERIES

600 Series Model 644 Brazing Furnace



500 Series Model 627



500 Series Model 548 Humpback

AIR ATMOSPHERE CONTINUOUS FURNACES TO 1700°C

700 Series Model 71212 Auto

GENERAL DESCRIPTION

CM's "700 Series" line of high temperature furnaces was primarily developed for the continuous sintering of various ceramic bodies at temperatures in excess of 1600°C. Although they are generally used for oxidizing atmospheres, the furnaces are suitable for use in inert atmospheres. They are also available with our completely automated closed loop pusher option. The insulation package consists of graded high purity aluminum oxide brick and fiber designed for maximum temperature efficiency and uniformity. Molybdenum disilicide heating elements are utilized and are designed for ease of replacement through the roof section. Low watt densities are designed into the system to ensure long element life at continuous operating temperatures up to 1700°C. The specification chart lists sizes which have become standard. However, CM will design a system based on your particular process requirements.

SPECIFICATIONS

						AUTOMATION	
MODEL NO.	HEATING ELEMENT	FURNACE OPENING HxW	HEATED LENGTH	NO.OF ZONES	ATMOSPHERES	EXTERNAL STOKER	INDEXING PUSHER
744	MOLYBDENUM DISILICIDE	4"x 4"	36"- 60"	1-3	AIR INERT*	•	•
746	MOLYBDENUM DISILICIDE	4"x 6"	36"- 72"	1-6	AIR INERT*	•	•
766	MOLYBDENUM DISILICIDE	6" x 6"	36"- 72"	1-6	AIR INERT*	•	•
788	MOLYBDENUM DISILICIDE	8" x 8"	48" - 84"	1-6	AIR INERT*	•	•
71010	MOLYBDENUM DISILICIDE	10" x 10"	60"- 96"	1-6	AIR INERT*	•	•
71212	MOLYBDENUM DISLICIDE	12" x 12"	60"- 96"	1-6	AIR INERT*	•	•

***INERT ATMOSPHERES WILL LIMIT MAXIMUM OPERATING TEMPERATURES. ALL DIMENSIONS IN INCHES.**
SILICON CARBIDE HEATING ELEMENTS ARE ALSO AVAILABLE FOR LOWER TEMPERATURE APPLICATIONS.

⋆Additional sizes are available

12 AUTOMATION

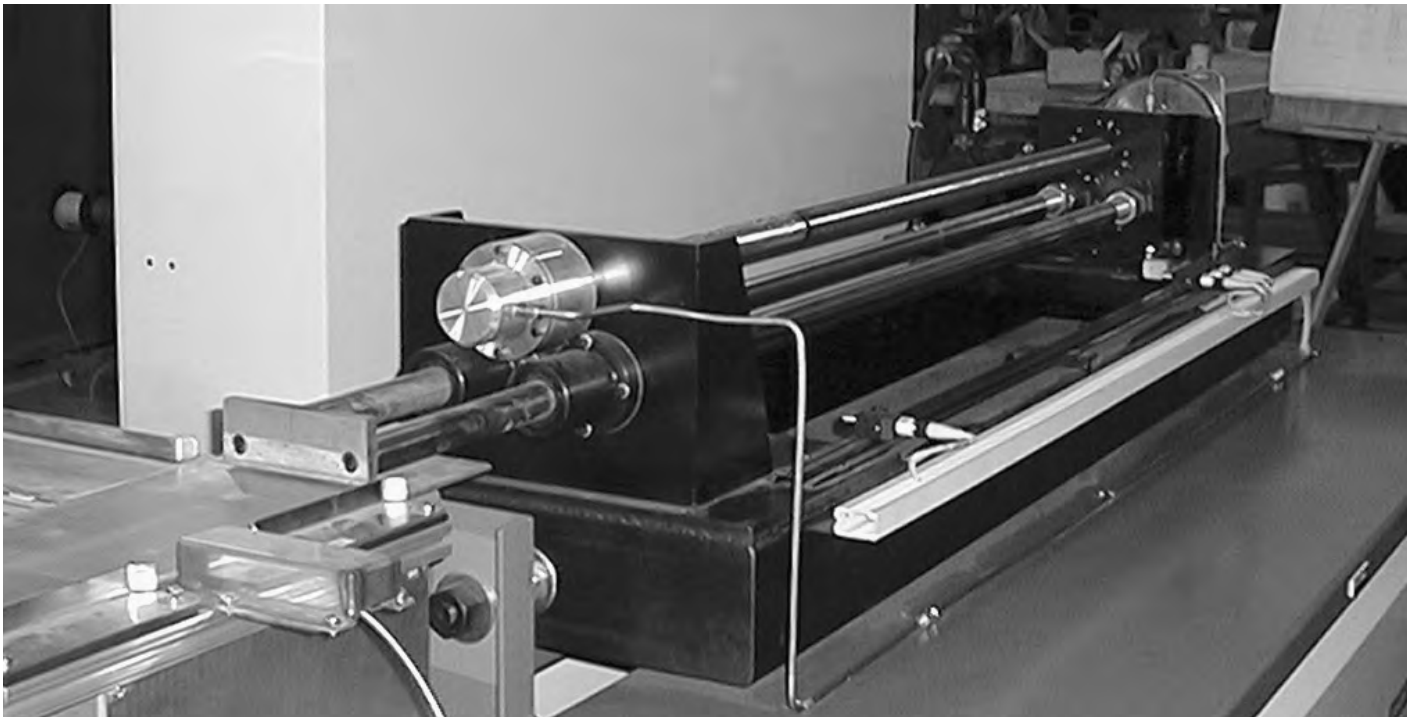
HIGH TEMPERATURE AUTOMATION SYSTEMS

BELT CONVEYER
All CM belt conveyers are matched to customer requirements with regard to temperature rating, mesh size and process atmosphere. Standard features include variable speed SCR drive, automatic tension control and controlled tracking.

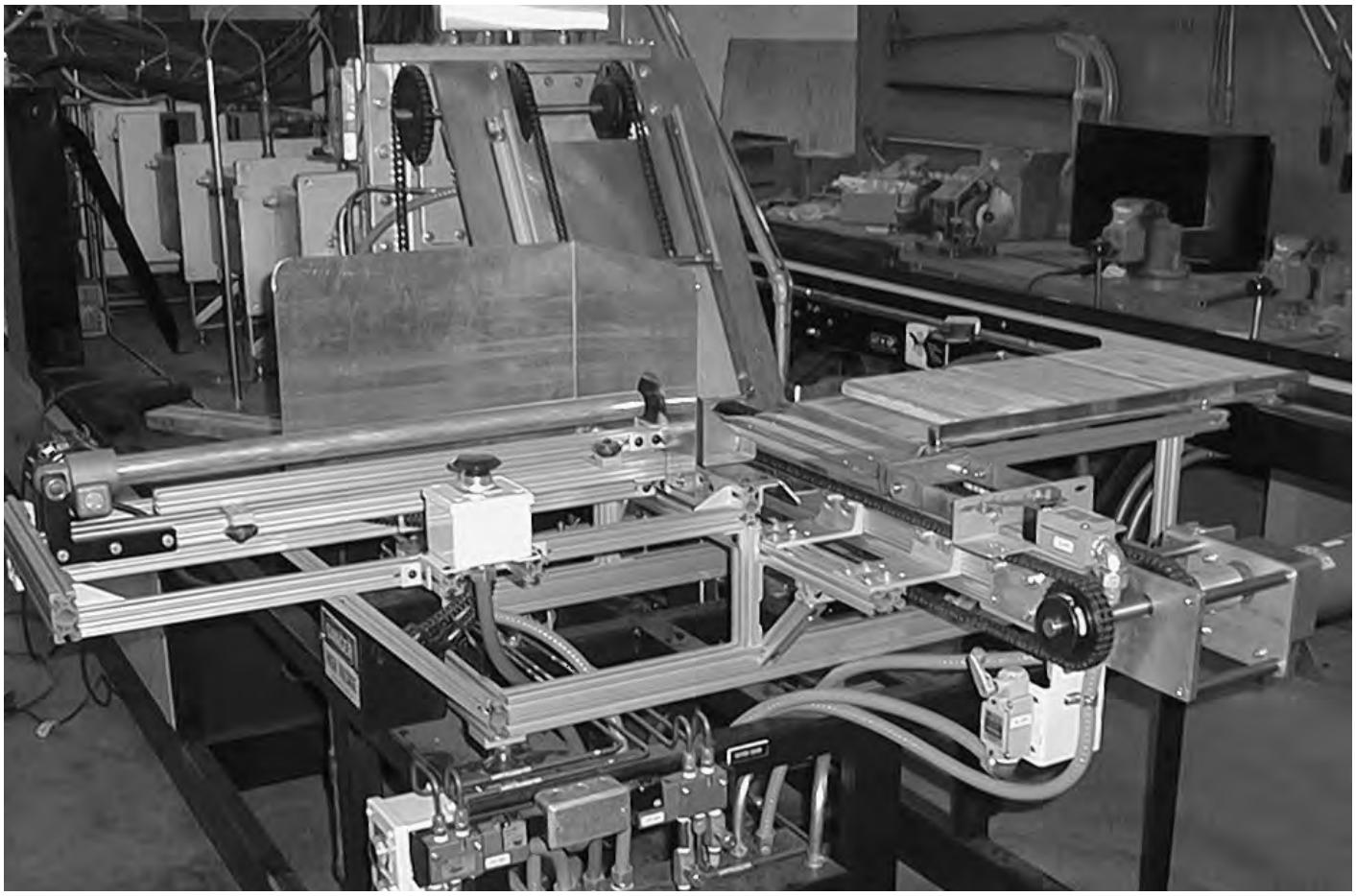
BALL SCREW PUSHERS
CM's integral automatic pusher systems are available on all continuous furnaces. They feature ball screw drives with ball nut and recirculating bearings. It is aligned by a Thomson linear shaft. CM pushers feature straight in loading with an AC servo drive system. Boats/plates are removed from the furnace with a unique fork extraction mechanism. Our variable speed AC Servo driven controlled pusher system features a time proven reliable microprocessor base PLC logic system.

SELF DIAGNOSTICS
All furnaces feature our self-diagnostic system. The PLC based system checks over 120 different events per cycle for any problem condition. It then gives you a readout via a touch screen for troubleshooting and ease of maintenance.

PUSHER CAPACITY
CM pushers come in 5000, 10,000, 20,000 and 30,000 lb. capacity. They are sized to fit your requirements.



Ball Screw Pusher



Fork Extractor and Crossfeed

EXTERNAL STOKER

CM offers both a light duty and heavy duty stoker which can be used with most continuous furnaces. The standard unit features a gear driven rack and pinion variable speed drive with a slip clutch and overload protection. The heavy duty unit utilizes an AC drive and linear bearings. Alarms are standard on both units.

Free Standing External Stoker

14 2300 - 3300 SERIES

HIGH TEMPERATURE FIBER LINED BOX FURNACES

INTRODUCTION
CM has developed a series of industrial high-temperature box furnaces employing the latest in fiber insulating technology, microprocessor control and heating element design. As the leader in high-temperature laboratory furnaces, our goal was to develop an energy efficient, responsive, dependable, high-temperature industrial furnace line as innovative as our Rapid Temp laboratory furnaces. We have carefully matched our insulating systems for various temperature ranges in a variety of sizes from a 1 cubic foot up to 64 cubic foot usable capacity. These rugged furnaces heat and cool in a fraction of the time required for conventional furnaces and use less power as well as achieving better uniformity and higher operating temperatures.

GENERAL DESCRIPTION
All CM fiber lined furnaces are constructed for typical production requirements. Heavy gauge steel is utilized for the case material and structural steel for the frame. Hot surface areas are shielded with removable panels for quick access to the electrical, terminal and element areas of the furnace.

2300 SERIES
Our lowest temperature series uses Kanthal A-1 or APM ribbon or rod heaters for a maximum use temperature of 1300°C. This series furnace is available with a removable metallic retort for atmosphere containment.

2800 SERIES
Utilizing all alumina fiber construction and employing silicon carbide heating elements, this inexpensive series of furnaces is available in both bottom and front loading configurations. The maximum recommended use temperature for this series is 1550°C.

2900 SERIES
Operating to a maximum use temperature of 1600°C and employing Kanthal Super 1700** heating elements, this fiber lined furnace series is ideal where processing temperatures are in excess of standard silicon carbide systems and extremely fast heating and cooling rates are required.

3100 SERIES
This hybrid series features the use of a high purity structural aluminum oxide brick and fiber insulation in combination with Kanthal Super 1800** heating elements. This furnace system is rated for continuous use temperature of 1700°C, while still maintaining relatively responsive heating and cooling rates.

3300 SERIES
This hybrid series features the use of a high purity structural aluminum oxide brick and fiber insulation in combination with Kanthal Super 1900** heating elements. This furnace system is rated for continuous use temperature of 1800°C, while still maintaining relatively responsive heating and cooling rates.

INSULATION
All fiber lined furnaces employ a block graded insulation system carefully selected for each temperature range. Depending on the size and the series selected, these systems utilize combinations of high-purity alumina fiber, reinforced fiber and high-purity aluminum oxide insulating brick.

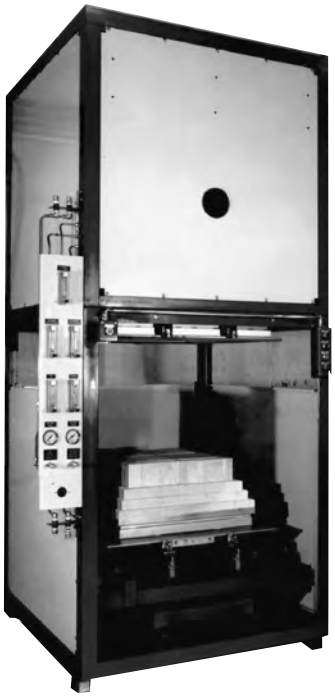
POWER SUPPLY AND INSTRUMENTATION
Our standard control systems feature microprocessor based programmable temperature controller in conjunction with the power supply. Separate independent overtemperature instrumentation and platinum alloy thermocouples are standard. All necessary transformers, circuit breakers, relays, ammeters are also supplied. The entire package is supplied complete and ready for immediate installation to your plant's electrical service. Recording instrumentation is also available. Please consult CM directly for custom applications.

PRECISION ELEVATOR
All CM power lifts feature a self contained hydraulic scissor lift. The lift is permanently mounted in the frame work. This provides positive alignment and a smooth ascent and descent. A safety interlock is included in the system. Single or dual shuttle carts are optional.

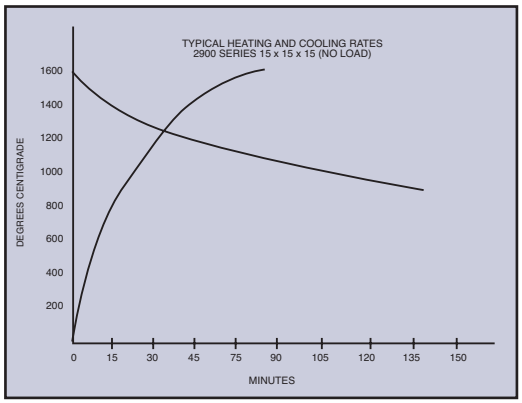
**TM KANTHAL CORPORATION.

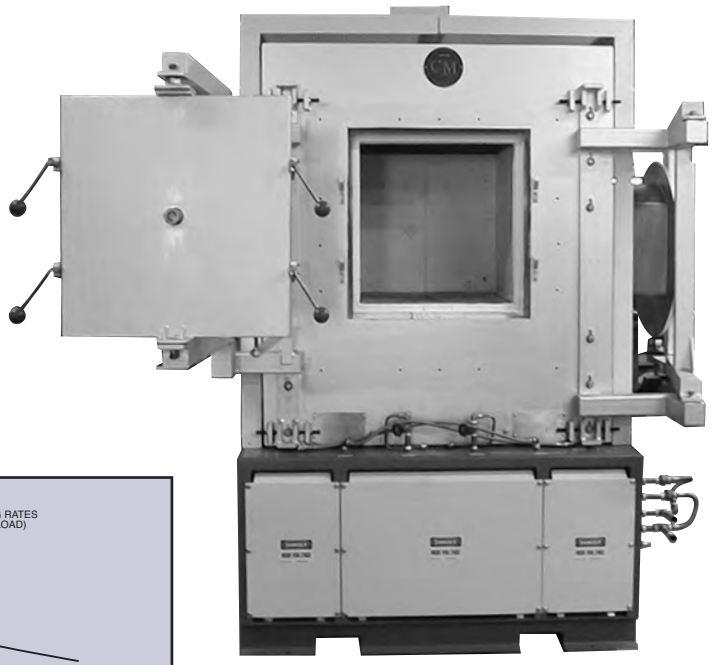
3300 Series 242424 GSBL with single shuttle

2800 Series with Retort



3100 Series 242424GSBL





2800 Series 242424 FL

16 2300 - 3300 SERIES

SPECIFICATIONS

TYPE	MAX. TEMP.	USABLE CAVITY WxHxD	OD DIMENSIONS WxHxD	INSULATION	ELEMENTS	+WATTS
2300 SERIES	1300°C	15” x 15” x 15” 15” x 15” x 30” 20” x 20” x 20” 24” x 24” x 24” 24” x 24” x 36” 36” x 36” x 36”	36” x 72” x 36” 36” x 72” x 51” 44” x 74” x 44” 48” x 76” x 48” 48” x 76” x 60” 60” x 82” x 60”	ALUMINA FIBER	KANTHAL++ A1	16000 20000 24000 32000 40000 70000
2800 SERIES	1550°C	15” x 15” x 15” 15” x 15” x 30” 20” x 20” x 20” 24” x 24” x 24” 24” x 24” x 36” 36” x 36” x 36”	36” x 72” x 36” 36” x 72” x 51” 44” x 74” x 44” 48” x 76” x 48” 48” x 76” x 60” 62” x 82” x 60”	ALUMINA FIBER	SILICON CARBIDE	17000 26000 23000 35000 41000 70000
2900 SERIES	1600°C	15” x 15” x 15” 15” x 15” x 30” 20” x 20” x 20” 24” x 24” x 24” 24” x 24” x 36” 36” x 36” x 36”	36” x 72” x 36” 36” x 72” x 51” 44” x 74” x 44” 48” x 76” x 48” 48” x 76” x 60” 60” x 82” x 60”	ALUMINA FIBER	KANTHAL SUPER 1700++	23800 36100 34000 50300 64500 107000
3100 SERIES	1700°C	15” x 15” x 15” 15” x 15” x 30” 20” x 20” x 20” 24” x 24” x 24” 24” x 24” x 36”	40” x 78” x 38” 40” x 78” x 53” 45” x 80” x 46” 50” x 82” x 52” 50” x 82” x 64”	ALUMINA BRICK AND FIBER	KANTHAL SUPER 1800++	38175 57850 57000 80500 100000
3300 SERIES	1800°C	15” x 15” x 15” 15” x 15” x 30” 20” x 20” x 20” 24” x 24” x 24” 24” x 24” x 36”	40” x 78” x 38” 40” x 78” x 53” 45” x 80” x 46” 50” x 82” x 52” 50” x 82” x 64”	ALUMINA BRICK AND FIBER	KANTHAL SUPER 1900++	38175 57850 57000 80500 100000

All Dimensions in inches

AVAILABLE IN BOTTOM LOADING VERSION, OD DIMENSIONS AND WATTAGES WILL VARY.

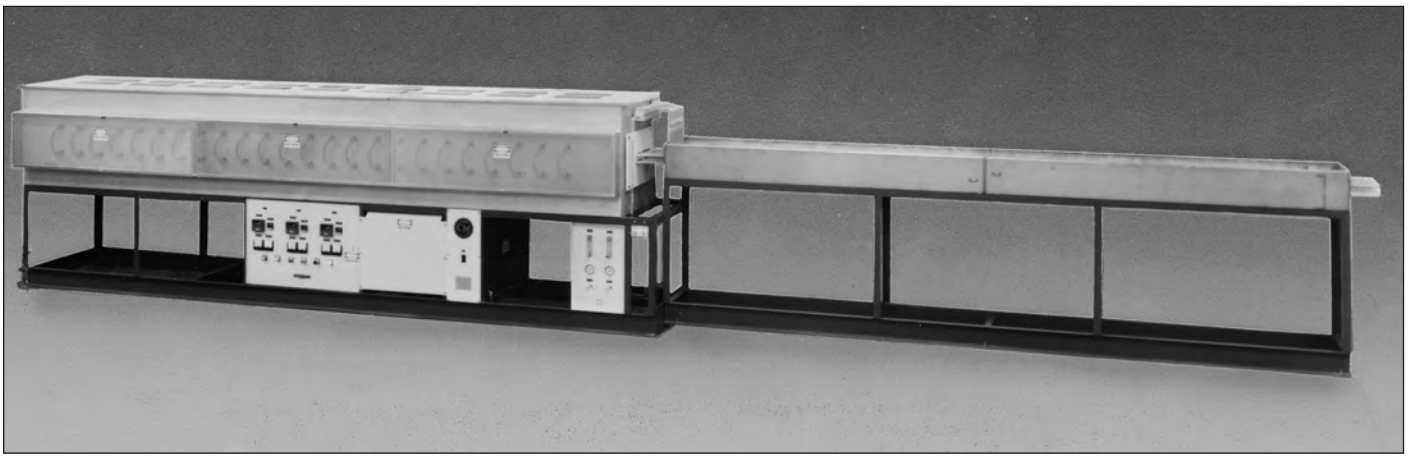
+ STATED POWER REQUIREMENTS ARE FOR MAXIMUM TEMPERATURE, MINIMUM TIME, UNDER LOAD CONDITIONS. NORMAL STEADY STATE OPERATION WILL REQUIRE LESS POWER. ALL WATTAGES ARE APPROXIMATE.
++ TRADEMARK KANTHAL CORP.

⋆Additional sizes are available

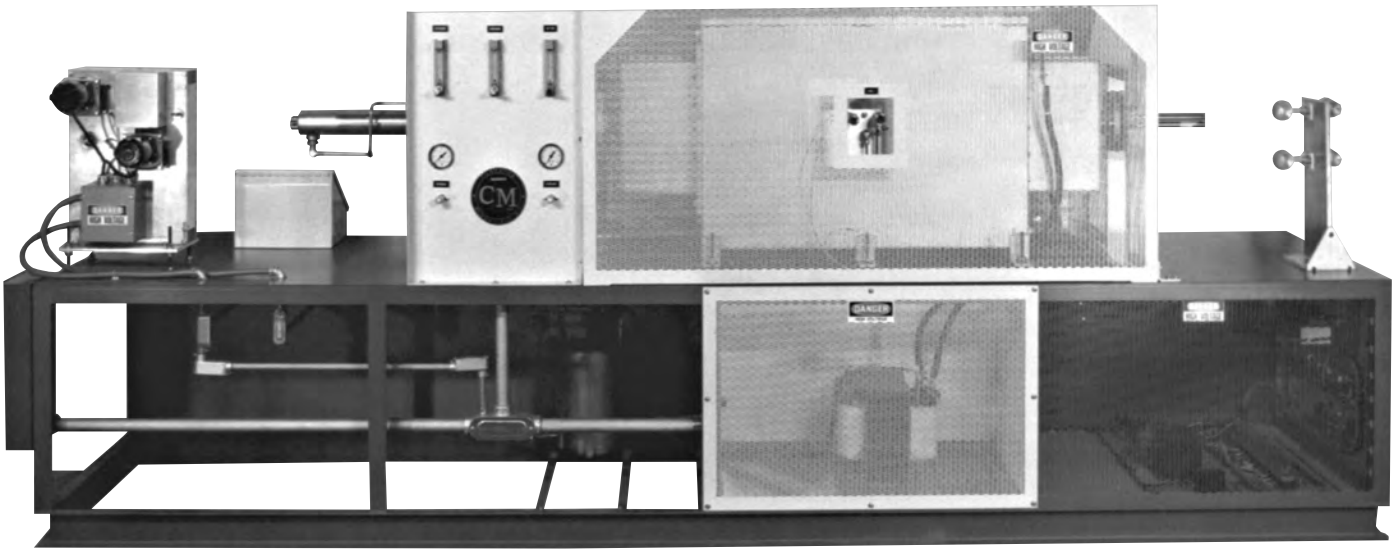
WIRE ANNEALING FURNACES

GENERAL DESCRIPTION

CM Annealing Furnaces are designed and manufactured for years of trouble-free service in the processing of wire, rod, strand, strip and tube products. Ideally suited for copper, copper alloy, nickel, nickel chrome, titanium, stainless steel, molybdenum, tungsten and rhenium, CM furnaces feature rugged heavy duty construction, state-of-the-art electronics and our energy-saving combination of fiber and brick insulation. Three basic temperature ranges are available: 1000°C (1850°F), 1200°C(2200°F), and our ultra-high temperature model which operates to 1750°C (3200°F). In addition to standard sizes listed, CM will modify existing designs to meet particular process requirements. All furnaces are completely assembled, factory pre-tested and ready for immediate installation.



200 Series Model 200 SA 180-180-16



300 Series Model 325-36 Four Bore Annealer

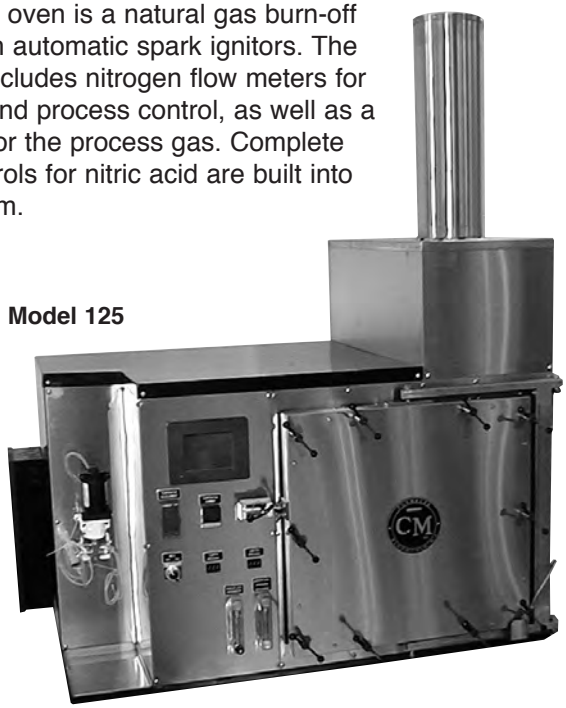
18 100 SERIES

CATALYTIC DEBINDING OVEN FOR BASF POLYACETAL BINDER SYSTEM

CM Furnaces offers a complete line of debinding ovens specifically designed to process components containing BASF polyacetal binder. Whether your requirement is for small research quantities or large scale production, one of the two standard size batch ovens is sure to fit your need. The systems come complete with all temperature, atmosphere and safety controls contained in a common frame.

All stainless steel construction is used for the 100 Series including the inner chamber and removable racks. Inside the chamber is a stainless steel fan for the controlled recirculation that is so critical to the process. The front door is swing away style with safety interlocking. At the top of the oven is a natural gas burn-off stack with automatic spark ignitors. The system includes nitrogen flow meters for purging and process control, as well as a preheat for the process gas. Complete acid controls for nitric acid are built into the system.

CM Model 125



Control of the oven includes an Allen Bradley PLC process controller, programmable microprocessor controller, SCR power controller and a touch screen for operation and diagnostics. Other features include independent overtemperature instrumentation and process timer.

FULL SYSTEM INCLUDES:

- Total System Packaged in Common, Compact Frame
- Stainless Steel Construction
- Multiple Removable Racks
- PLC Process Controller
- Digital Temperature Indicator
- Independent Overtemperature Control
- Adjustable Process Timer
- Nitrogen Flow Meter and Preheater
- Nitric / Oxalic Acid Pump with Controller
- Ceramic Drip Dish with Heater
- Guaranteed Purges
- Recirculating Fan
- Natural Gas Burn-Off Stack
- Spark Ignitor System
- Safety Door Interlock
- Diagnostic Touch Screen

USED FOR THESE AND OTHER APPLICATIONS:

- PIM (Powder Injection Molding)
- MIM (Metal Injection Molding)
- CIM (Ceramic Injection Molding)

	125	1100
Maximum Operating Temperature	175°C (350°F)	175°C (350°F)
Chamber Dimensions W x H x D	20” x 18” x 15”	26” x 26” x 26”
Number of Racks	8	8
Outside Dimensions W x H x D	60” x 70” x 46”	53” x 117” x 61”
Power Requirement (Maximum) KVA	9	10
Standard Voltage Requirement	208/240 1-Phase	230 3-Phase
Service Entrance Current Requirement at 208	50	50

HYDROGEN ATMOSPHERE BATCH FURNACES

CM Model 1516GSH2FL

CM Model 1716GSH2BL

FULL SERVICE INCLUDES FURNACE WITH:

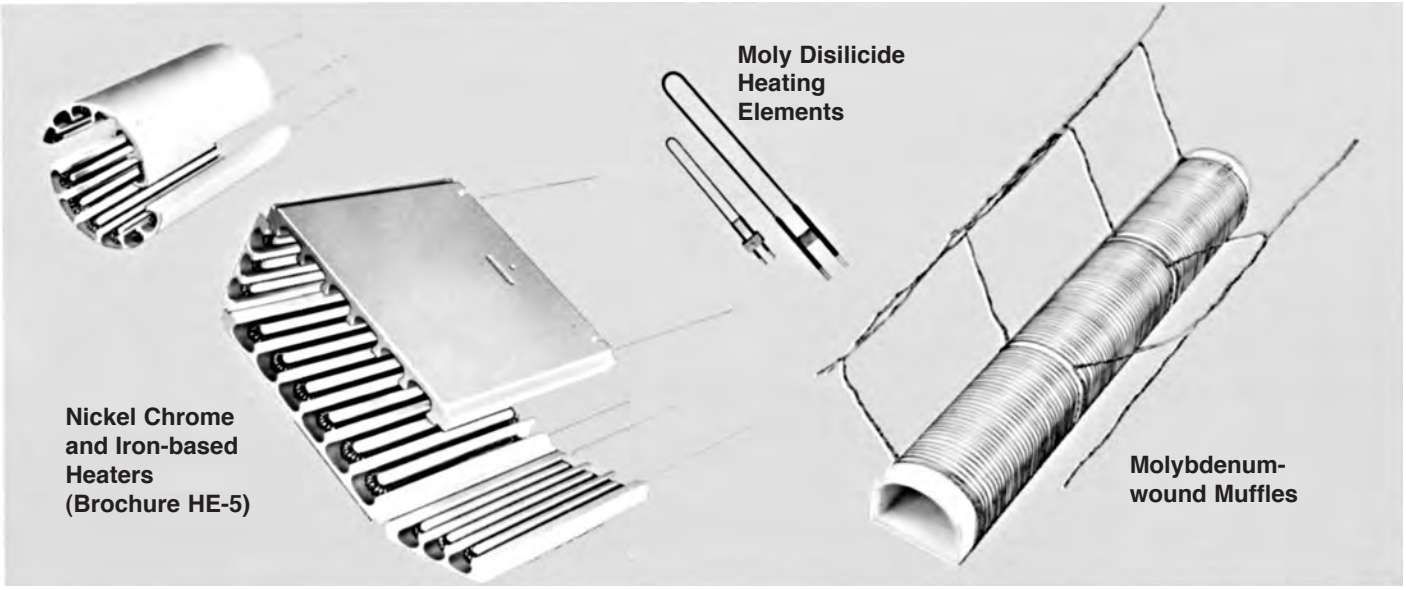
- Ability to debind and sinter in one step
- Total System Packaged in Common, Compact Frame
- Hanging Molybdenum Elements for Reducing and Reducing/Inert Atmospheres
- High Purity Alumina Fiber Insulation Package for Efficiency and Rapid Response
- Programmable Ramp and Soak Control – 16 segments per recipe, 4 recipes
- Atmosphere Mixing Panel
- Hydrogen Safety System and Burn Off
- Guaranteed Purges
- Independent Overtemperature Thermocouple and Instrument
- Type “B” Sealed Thermocouples
- Allen-Bradley PLC with Touch Screen
- Phase Angle -Fire SCR Power Controller
- Step-Down Transformer
- Water-Cooled Door Seal and Element Terminals
- Constructed per NEC Standards
- CE/CSA Compliant Systems Available
- Atmosphere Humidifier (Bubbler) Available
- Dewpoint and Oxygen Monitors Available

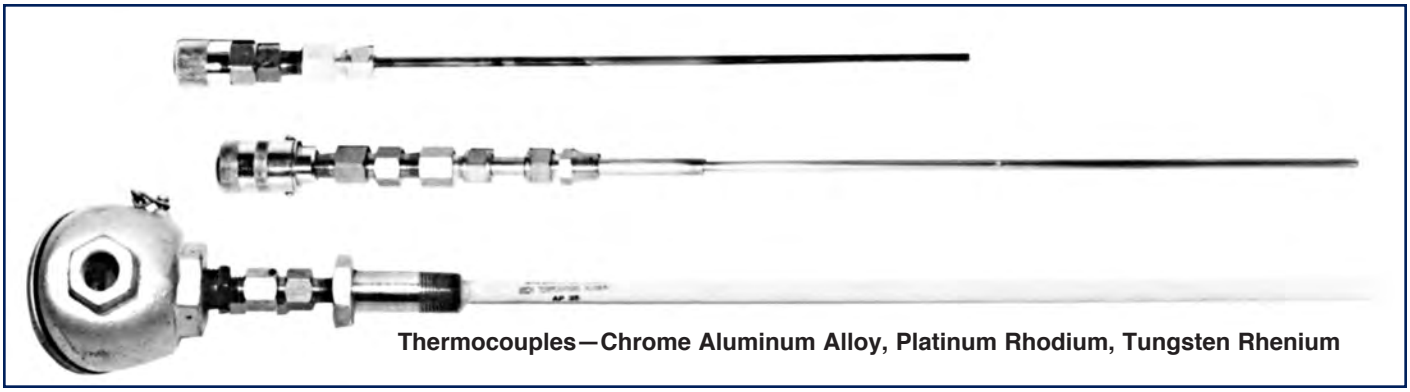
SPECIFICATIONS FOR 1500 AND 1700 SERIES HYDROGEN ATMOSPHERE BATCH FURNACES

	1512GSH2	1516GSH2	1712GSH2	1716GSH2
Maximum Operating Temperature	1450°C / 2640°C	1450°C / 2640°F	1700°C / 3100°F	1700°C / 3100°F
Chamber Dimensions W x H x D	13” x 11” x 12”	16” x 16” x 16”	13” x 11” x 12”	16” x 16” x 16”
Door Opening W x H	10” x 10-3/4”	14” x 14-3/4”	10” x 10-3/4”	14” x 14-3/4”
Outside Dimensions W x H x D Front Loading	67” x 81” x 44”	67” x 81” x 44”	67” x 81” x 44”	67” x 81” x 44”
Outside Dimensions W x H x D Bottom Loading	78” x 97” x 44”	78” x 97” x 44”	78” x 97” x 44”	78” x 97” x 44”
Power Requirement (Maximum) KVA	18	30	18	30
Power Requirement (Nominal) KVA	8.5	12	9.5	14
Standard Voltage Requirement	480 / 3-Phase	480 / 3-Phase	480 / 3-Phase	480 / 3-Phase
Service Entrance Current Requirement	35	60	35	60

20 FURNACE REPLACEMENT

Silicon Carbide Heating Elements, Straps, Clamps, and Accessories





Thermocouples—Chrome Aluminum Alloy, Platinum Rhodium, Tungsten Rhenium

PARTS AND ACCESSORIES 21

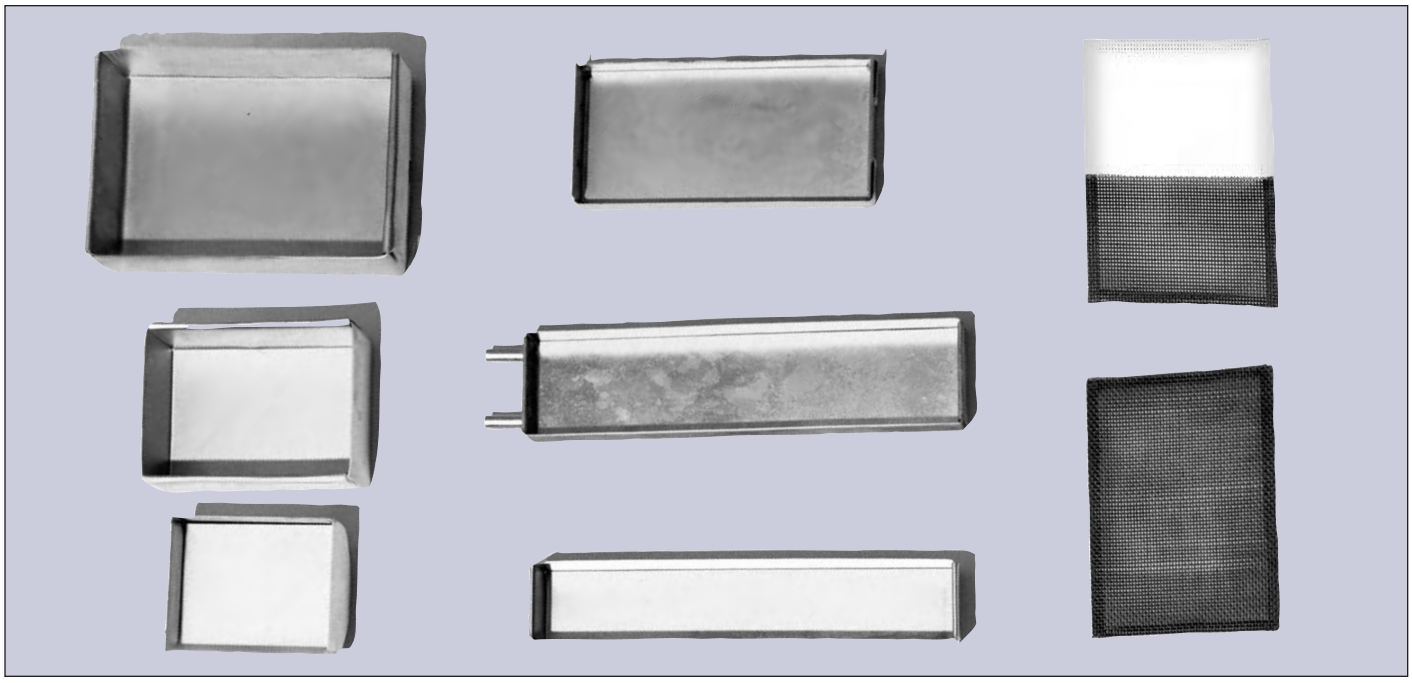
CM HYDROGEN HUMIDIFIER

The CM safety proven stainless steel hydrogen humidifier has received universal acceptance where continuous and precise dewpoint control is essential. Although designed primarily for hydrogen and other reducing atmospheres, this system can be used with various processing atmospheres compatible with copper based and stainless steel construction material.The hydrogen humidifier is available in 3 gallon and 15 gallon capacity and can be supplied with optional electrically activated automated bypass.

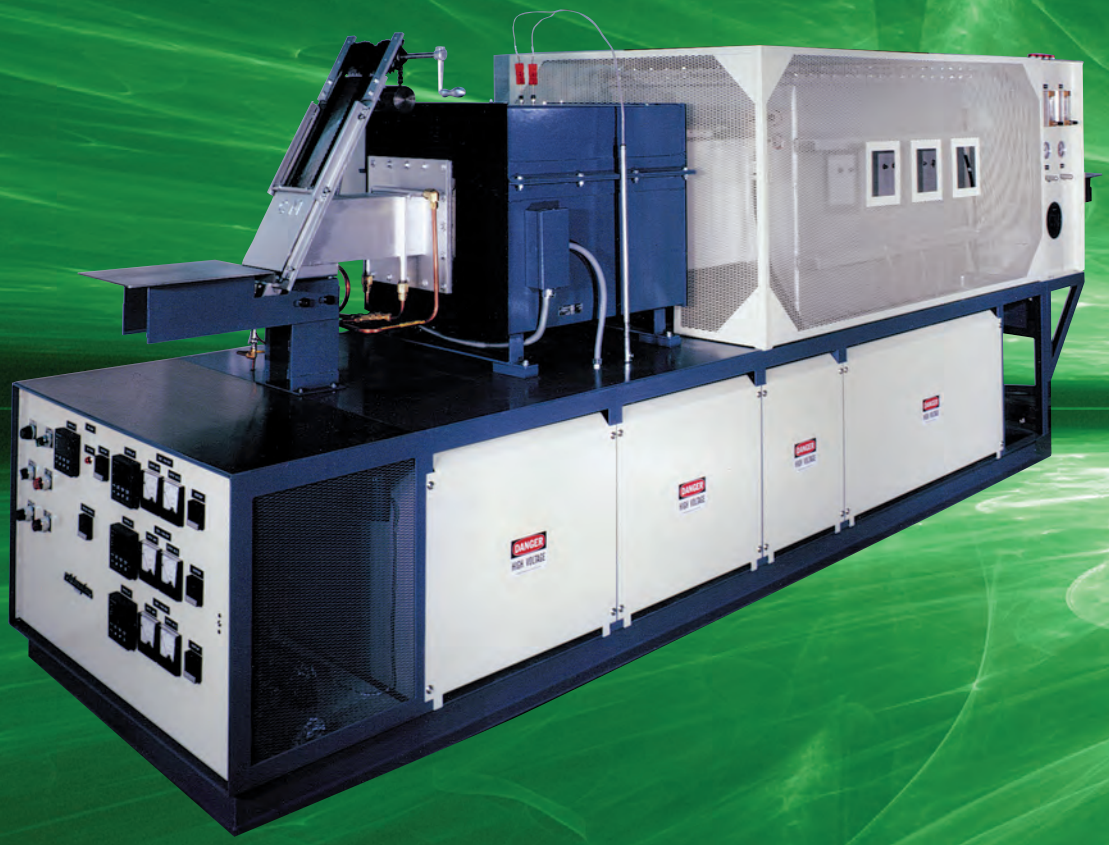
Hand Held Hydrogen Sniffer

Model H258 Humidifier with Bypass

Refractory Metal Boats and Screens



Insulating Brick, Fiber, Cement, Powders, and Alumina Muffles



CM FURNACES INC.

103 Dewey Street, Bloomfield, N.J. 07003
PHONE: (973) 338-6500 FAX: (973) 338-1625
E-Mail Address: info@cmfurnaces.com
World Wide Website: www.cmfurnaces.com

REV 02/2013