



Manufacturers of High Temperature & High Vacuum Equipment

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## Specification Sheet

Equipment Model: J-12-1848 High Temperature Furnace

<b>Type</b>	Coldwall, Vertical Bell
<b>Maximum Temperature</b>	1250 Degrees C.
<b>Hot Zone</b>	18" (45 cm) Dia. x 48" (120 cm) H. Nominal
<b>Frame Dimension</b>	54" (137 cm) W. x 34" (86 cm) D. x 145" (360 cm) H.
<b>Power Requirements</b>	480V 3 Ph. 120A 60 Hz – 240V 3 Ph. 240A 60 Hz.
	380/400/415V 3 Ph. 120A 50 Hz.
<b>Gas Requirements</b>	25 – 50 psig, regulated, clean dry Nitrogen
	25 – 50 psig, regulated, clean dry Hydrogen
<b>Vacuum Purge</b>	11 CFM mechanical pump, inline traps and filters
<b>Thermocouple</b>	Type "K" Chromel-Alumel /Control & Monitor
<b>Compressed Air</b>	80 PSI regulated, Clean/Dry

Purge gas is Nitrogen.

Process gas is Hydrogen or Nitrogen or a mixture of both.

Process gas can be humidified via a heated bubbler to over 18 degrees C. Dewpoint.

**Cooling Requirements** - 35 psig, at 10 gallons per minute.

Note: maximum backpressure is 15 psig.

Heat up ramp rate 50 degrees C per minute - empty chamber.

All molybdenum Hot Zone & elements. All insulators are made of High Alumina.

Element style - 1/8" molybdenum wire.

### Standard Features:

- Burnoff column
- Bubbler for humidification of process gas
- Equipment on casters to roll into place
- Honeywell Controls - Ramp & Soak
- DCP302 Program Controller
- UDC2500 Overtemp Control
- 19 Programs - 20 segments per program
- Dual Sight glass for calibration melts
- Active Braze Control
- Survey Thermocouple attaches to load and controller for tight process control.
- Fully automatic - One button push starts the run. Automatically it will purge - process gas fill - ramp to temperature and soak - bubbler for humidification of process gas - cooldown - post purge.

### Options:

- Extension Table
- Cable Hoist
- Chart Recorder
- Video Recorder
- Dewpoint Monitor
- Vacuum Purge
- Tower Indicator Lights
- Survey Thermocouples
- Computer Controls



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## Equipment Description

### CAMCo 18" Dia. x 48" H., 1250 deg. C

#### **VERTICAL, COLDWALL REDUCING/INERT ATMOSPHERE FURNACE**

For Programmed Continuous Operation to 1250 Deg. C.

### Model J-12-1848



### **Overview**

The model J-12-18x48 Furnace currently has the largest hot zone at 1250° C available to our customers in the coldwall style chamber. The model J-12-18x48 offers a hot zone at 18”(45cm) diameter by 50”(127cm) high. It has a bell type chamber assembly that is raised off the bottom chamber assembly to expose an 18”(45cm) diameter hearth plate that is located at a convenient height to load and unload parts of up to (120cm) 4 feet in height.

It is dual zone controlled for temperature uniformity. The furnace and vacuum controls, pump system and interlocks are integrated in a fully automated computer controlled unit to assure simple, reliable operation. It is designed to operate at temperatures up to 1250 deg C (2350 F) at 10-6 torr vacuum. It is designed to operate in a Hydrogen/Nitrogen mixed atmosphere and has the ability to divert a portion or all the process gas through a water filled bubbler to humidify the gas for processes requiring a reducing atmosphere. The furnace is fully automatic requiring the operator only to load the parts, select the desired program for processes, lower the chamber and press start. The furnace will automatically purge - process gas fill - ramp & soak to the pre-programmed temperature - cool down at a controlled rate and post purge.

### **Base Unit**

The base unit measures 54" wide by 34" deep by 60" high. Its' substantial frame is constructed of heavy wall square steel tubing. With the chamber fully raised the hoist and chamber assembly is 14 feet (425cm) high. Service access is readily gained through a hinged steel door and the removable front, side and rear panels.

The plate steel floor within the base unit supports the heating transformer and closes the bottom. Also contained within the base are the SCR units, power components, and other electronics. At the lower right are the atmosphere control module, gas plumbing and cooling water plumbing. The roughing pump is located within the right side of the cabinet. In addition, the base frame supports the instrument console and the water-cooled chamber bottom end at a convenient operator height for loading of product. A fan at the rear of the base unit draws cooling air through a replaceable filter element to cool the power control unit and transformer.

A handy feature is the inclusion of **recessed heavy-duty casters**. The unit is easily rolled into place, and the leveling feet lowered to immobilize and level the equipment. **With the removal of the hoist assembly and the top cover this unit can fit through a standard door.** The finish used on this, and all CAMCo equipment is baked powder coating, chosen for its' durability. The stainless steel top skin reduces the possibility of load contamination.

### **Hoist Assembly**

The chamber/furnace assembly is mounted to the arm of the motor driven hoist assembly by which it may be raised to provide access to the work area. The mounting allows the chamber to lift with respect to the hoist. The hoist itself is screw driven, and cannot inadvertently lower on the removal of power. Its speed is approximately eighteen inches per minute, a rate that is slow enough to minimize jarring, while not being inconvenient. Limit switches control the extremes of travel. Large bearing areas assure hoist rigidity and long life, and further assist in providing close registration of the chamber to the chamber bottom assembly upon closing.

## Temperature Control

Temperature control and monitoring functions to 1250 deg. C. are achieved using type “K” Chromel vs. Alumel thermocouples. This Thermocouple, in close proximity to the element zone, ensure long furnace life by controlling the element temperatures to safe values regardless of load thermal mass. Multi-stage programmed control is achieved through use of a two channel Honeywell process controller which compares the setpoints with the inputs from thermocouples located in close proximity to the heating elements, sending an appropriate drive signal to the SCR power controllers. Totally automatic time/temperature programmed control of up to nineteen different, 19 segment programs may be stored.

Load temperature monitoring is provided by a second thermocouple located within close proximity to the load. It drives a Honeywell UDC2500 process monitor, which provides digital readout of the load area, and an over temperature shutdown signal. The process monitor also provides a safe chamber access interlock signal for the safety operator.

A thermocouple feed through at the bottom of the chamber and related holes in the shields allow survey thermocouples to be inserted to monitor actual temperature of load. These thermocouples can be used in conjunction with the “Active Closed Loop Braze Control”.

## Active Closed Loop Braze Control

The Furnace comes standard with one type “K” Inconel sheathed survey thermocouple that can be attached to the workload. This thermocouple drives a second channel on the program controller that can be integrated with the process control. These thermocouples are rated for use up to 1250° C (2250° F).

## Operation

The work is loaded onto the 18”(45cm) diameter hearth plate and the chamber is lowered via the hoist switch. One of 19 selectable, user programmed thermal profiles is chosen, and the “RUN” key pressed. A one button push will start the run and automatically it will purge, process gas fill, ramp to temperature and soak, activate the bubbler for humidification of process gas, cool down and post purge. Upon completion of the cool down portion of the program, the chamber is opened and unloaded.

## Chamber/Furnace assembly

The stainless steel water-jacketed chamber bottom end is mounted on the base unit. It is sealed to the chamber by a flange containing a viton “O” ring. Four high pressure pneumatic clamps are used to keep the chamber sealed from atmosphere. The location of the seal is such that it is well cooled and optically baffled assuring long life. The chamber bottom includes work and survey thermocouple feed-throughs, gas admission and vacuum gauges. It supports the Molybdenum hearth and bottom end stack of six shields via the lower support structure.

The furnace hot zone is located within the jacketed stainless steel chamber. It incorporates two sets of Molybdenum heating element consisting of six sections each supported by high alumina insulators. This surrounds the eighteen-inch diameter by forty-eight-inch high work area. A series of four Molybdenum cylindrical heat shields and the top and bottom stack of four shields surround the elements. This assembly is supported from the inner wall of the chamber.

In addition, the chamber includes 12 insulated water-cooled power feedthroughs, 2 control thermocouples, 2 sightports, and required cylindrical heat shield support structure. Perforated stainless steel guards surround the heater power feedthroughs and provide electrical protection to the operator. The chamber assembly is supported by the hoist arm, and is located by pilot guides to assure accurate registration to the chamber bottom assembly when the furnace is lowered. Pneumatic clamping assures a positive seal to the bottom chamber assembly.

## Power Control

Power is proportionally controlled through use of two digitally controlled SCR three phase power module. These units are phase angle fired control, and includes three phase current limiting made necessary by the strongly positive resistivity coefficient of the heating element. Impedance match of the heating elements to the incoming power is accomplished through a conservatively rated 40 KVA transformer driven by this power module.

## Atmosphere Control

Customer supplied Hydrogen and Nitrogen gasses are admitted to the chamber through programmed valves and preset flow-meters. An interlock is included which provides for automatic Nitrogen purge in the event of loss of Hydrogen/Nitrogen or chamber pressure.

Operator set flow-meters control the flow of gasses to achieve the appropriate operating atmosphere.

Included is a system which, when called to do so by the installed program, humidifies a portion of the selected process gas via a bubbler column. This gas is then recombined with the remaining process gas in a pre-selected ratio to obtain the desired process dewpoint (in degrees C).

The included bubbler column will humidify the process gas to a dewpoint of up to 25 deg. C. Higher dewpoint equipment, and controlled temperature bubblers are available.

Exhaust gas is routed through a check valve in the exhaust line from the top of the chamber. This valve establishes a slight positive pressure when the chamber is sealed. As a safety feature, absence of this pressure prevents admission of Hydrogen and inhibits the application of heater power.

An exhaust gas burn-off column electronically ignites the waste gas. Ignition is called for automatically at all times that Hydrogen is called for, and the unit attempts re-ignition should the flame be inadvertently extinguished. The ignitor is automatically tested to assure proper operation each time a run is started.

All gas plumbing and components are Stainless Steel. All gas connections are high quality high-pressure swagelok fittings.

## Safety Features

- Thermocouple break protection (Thermocouple burn-up) assures that heating power is removed from the furnace in the event of sensor failure.
- Over-temperature indication is monitored on a separate control module from the microprocessor, ensuring element shutdown in case of a run-away.

Other numerous interlock functions protecting the operator and equipment include:

- Panel Interlock
- High Cabinet Temperature
- Low Coolant Flow
- Low Gas Pressure Switches
- Heaters are hardware interlocked with the water flow switch so that heating will not occur if there is insufficient water flow
- Low chamber pressure reverts to nitrogen purge
- Normally open solenoid valve for the nitrogen purge guarantees nitrogen flow in the event of a power failure.

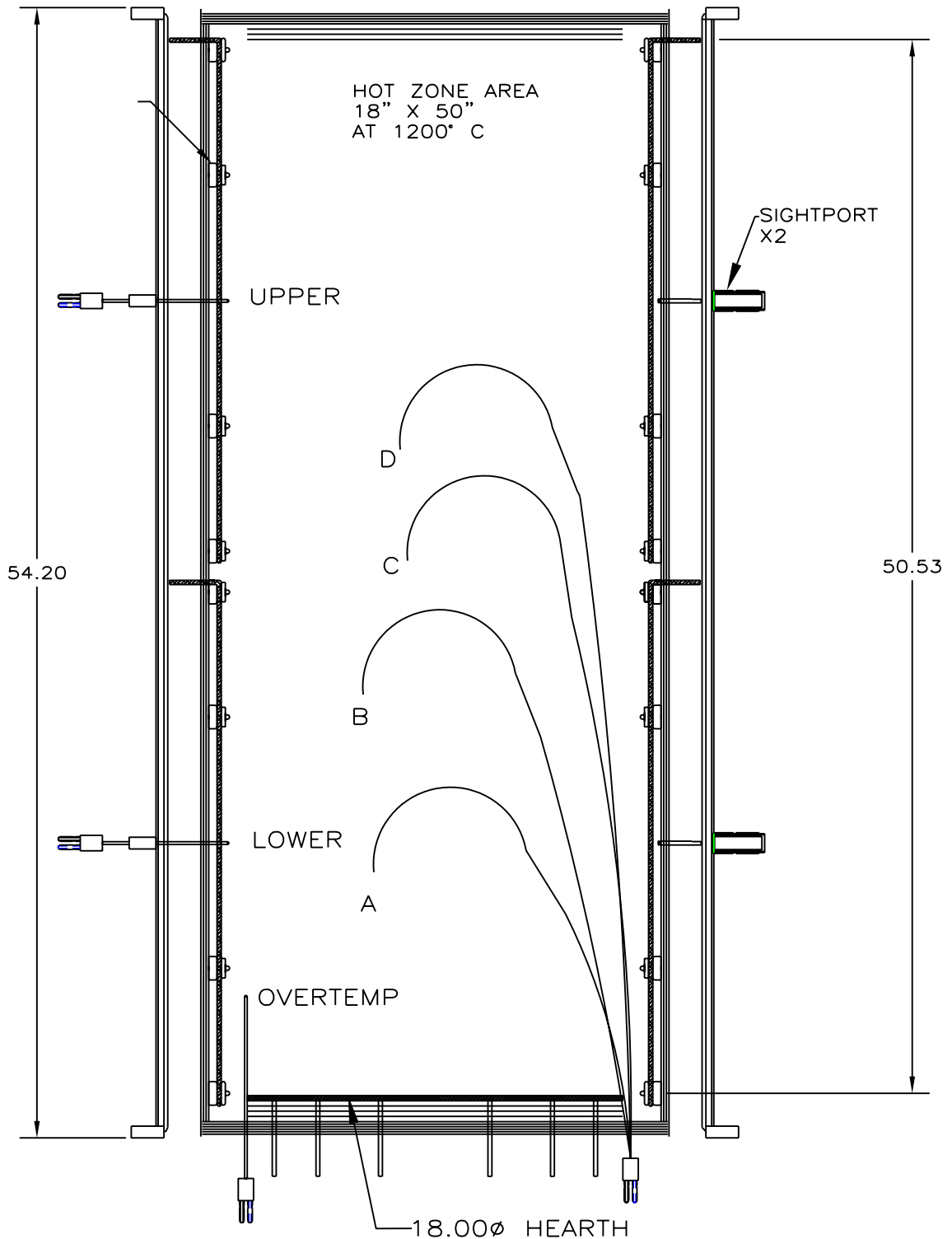
## Documentation

Facilities information is supplied to assist in site preparation for installation. An operating manual is supplied with the equipment. Worksheets included in the manual provide a convenient form to depict the desired process for entry into the microprocessor controller. The worksheets also serve as a hard copy of the program. The unit is shipped with an example program stored in memory, depicted by the example worksheet.


Wiring and plumbing schematics along with a published spare parts list are also included in the manual. Vendor supplied manuals for the program controller, overtemp, SCR, recorder, dewpointer, and other small items are supplied in our documentation. A program and operation section has a complete button-by-button push instruction for installation of a generic program. Relatively simple operation of the furnace is well described and documented in the manual.

DUAL ZONE HEATING  
 18 X 50 HOT ZONE  
 ALL MOLYBDENUM SHIELDS  
 AND ELEMENTS

REV.	DATE	DESCRIPTION



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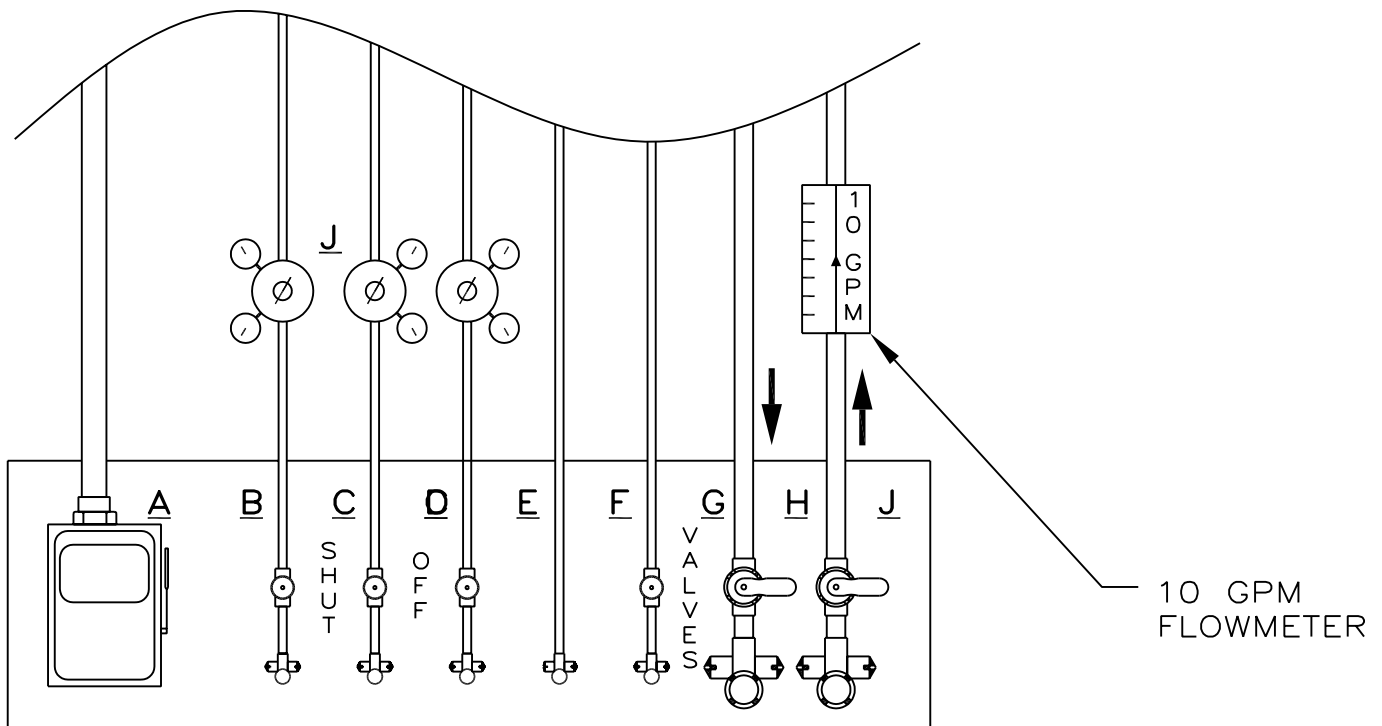
		TOL'S EXCPT AS NOTED	DRN.BY: T BARULICH	 <b>Concepts &amp; Methods Company, Inc.</b>	
		fract. ±1/32	APP.BY:		
		.XX ±.010	DATE: 8-29-05	TITLE: J-12-18X48 HOT ZONE	
J-VAC 18X48	318	.XXX ±.005	MAT: NOTED	DWG.NO: 88961	SHEET OF
USED ON TASK	FWO	.XXXX ±.0005	FINISH:	REV:	
		ANGLES ±1/2'			

REV.	DATE	DESCRIPTION

UTILITIES: PREPARED AS SHOWN BY CUSTOMER.

- |  |               |
|--|---------------|
| A: 120A./LEG @ 480V. 60Hz 3 PH DISCONNECT.                     |               |
| B: NITROGEN, 25 TO 50 PSIG AT A MAXIMUM FLOW OF 50 SCFH        | 1/4" SWAGELOK |
| C: HYDROGEN 25 TO 50 PSIG AT A MAXIMUM FLOW OF 30 SCFH         | 1/4" SWAGELOK |
| D: CLEAN DRY AIR, REGULATED AT 90 PSI                          | 1/4" SWAGELOK |
| E: PROCESS ATMOSPHERE EXHAUST (NOT NEEDED WITH BURNOFF OPTION) | 3/8" TUBE     |
| F: D.I. WATER FOR BUBBLER MAKEUP                               | 1/4" POLYFLOW |
| H: COOLING WATER SUPPLY; 30 PSIG MIN. AT 10 GPM.               | 3/4" FPT      |
| I: COOLING WATER RETURN OR PRESS. DRAIN IF USED.               | 3/4" FPT      |
| J: LINE PRESSURE REGULATORS SET AT 40 PSI.                     |               |

NOTE: (MAX. BACK PRESSURE 15 PSIG AT 4 G.P.M.)



SUGGESTED UTILITY PANEL LAYOUT

NOTE; WATER SUPPLY SHOULD BE CONNECTED TO EMERGENCY CITY WATER BACK UP IN CASE OF POWER FAILURE AT HIGHR TEMPERATURE OPERATION

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		fract. ±1/32	APP.BY:	
		.XX ±.010	DATE: 7-20-05	TITLE: J FURNACE FACILITIES PREP.
J-VAC COMBO 18X48	318	.XXX ±.005	MAT: NOTED	DWG.NO:
USED ON TASK	FWO	.XXXX ±.0005	FINISH:	SHEET 1 OF 3
		ANGLES ±1/2"		REV:

