



Manufacturers of High Temperature & High Vacuum Equipment

1017 Bransten Road | Phone (650) 593-1064
 San Carlos, CA 94070 | Fax (650) 593-4458

Specification Sheet

Equipment Model: J-VAC-12-18x80

High Temperature Heat Treating /
 Brazing Vacuum Furnace



Type	Vertical Bell with Chain Hoist
Chamber	Stainless Steel Coldwall with Internal Heating Elements
Maximum Temperature	1250°C (2300° F)
Hot Zone	18" (450 mm) Dia. x 80" (2000 mm) H. Nominal
Frame Dimension	77" (195 cm) W. x 36" (91 cm) D. x 145" (360 cm) H.
Power Requirements	480V 3 Ph. 180A 60 Hz
Gas Requirements	25 – 50 psig, regulated, clean dry Nitrogen
	25 – 50 psig, regulated, clean dry Argon
Compressed Air	80 PSI regulated, Clean/Dry
Vacuum Purge	28 CFM mechanical pump, inline traps and filters
Thermocouples, control and overtemp	Type "C" Tungsten / Rhenium
Survey Thermocouples	Type "K" .060 dia Inconel sheath, quantity 10
Turbo pump	ISO 250, 2000L/PS, (38,000 rpm) Ceramic Bearings
Vacuum level	5.0E-6 torr at temperature, 5.0E-7 at ambient
Heating Zones	3 independently controlled, 1 master, 2 slave
Element Style	.125 Dia. Molybdenum rod, aprox 60' per zone (250')
Gas flow during Argon operation	5 CFH minimum to achieve 5 to 50 mTorr Partial Pressure
Paperless data acquisition recorder	Yokogawa model DX1020, 20 channel recorder
SCR power control	Watlow Power Series SCR controller, 3 in total
Chamber construction	304 / 316 Stainless steel
Gas and Vacuum plumbing	304 / 316 Stainless steel, Swagelok, conflat and NW
Hoist	Coffing 1 ton chain hoist with Dual safety chains

Purge gas is Nitrogen.
Process gas is Argon (optional)

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

Note: maximum backpressure is 15 psig.

Heat Load 15 ton (180,000 BTU) at max power

Heat up ramp rate 60 degrees C per minute - empty chamber.

Three Heating Zones for temperature uniformity

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

Element style - 1/8" molybdenum wire.

Standard Features:

- 2000 LP/S Turbomolecular Pump
- 600 L/min Mechanical "Roughing" Pump
- Easy to Operate Microprocessor Controllers
- 19 Programs - 25 Segments per Program
- 20 Channel Digital Chart Recorder
- Ethernet Connectivity, FTP and Webserver
- Independent Heating Zones x 3
- Active Braze Control
- **Turnkey Solution** - One button push starts the run. Automatically it will:
 - Rough pump
 - Cross over to high vacuum
 - Ramp to temperature
 - Process soak
 - Cooldown
 - Safely stop turbo and let up to atmosphere
 - Amber indicator light when run is finished and safe to open.

Options:

- Dry Scroll Pump
- Survey Thermocouples (up to 8)
- Computer Controls
- Combination Hydrogen/Inert Operation
- Residual Gas Analyzer (RGA)
- Tower Indicator Lights - 3 Color

Camco Furnace warrants all materials and workmanship to equal or surpass generally accepted industry standards for one year from date of original shipment, and warrants performance to the enclosed specification as delivered. Where included items are warranted by others, their warranty takes precedence. The operation and application of this equipment when in the possession of others is not within the control of Concepts & Methods Co., Inc. We therefore may not in any way be held responsible and are saved harmless from any event arising out of possession or use, by the purchaser of this equipment. All equipment is subject to a 15% restocking fee with cancellation of order.



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Equipment Description

Model: J-VAC-12-18x80

CAMCo 18" Dia. x 80" H., 1200 deg. C

VERTICAL, TRI-ZONE, COLDWALL HIGH VACUUM FURNACE

For Programmed Continuous Operation to 1200 Deg. C.



Overview

The model J Furnace currently has the largest hot zone available to our customers in the coldwall style chamber. Its hot zone is 18" diameter by 80" high. It has a bell type chamber assembly that is raised off the bottom chamber assembly to expose an 18" diameter hearth plate that is located at a convenient height to load and unload parts of up to 80 inches in height.

It has a 3 zone heating chamber for temperature uniformity, using a modern Honeywell DCP302 microprocessor and 2 slave controllers for programmed ramp and soak control of up to 19 programs of up to 25 segments each. (Computer controls with Think and Do control software available). It is designed to operate in a high vacuum and partial pressure 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.

Base Unit

The base unit measures 90" wide by 40" deep by 19'-3" high. Its' substantial frame is constructed of heavy wall square steel tubing. 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 transformers and closes the bottom. Also contained within the base unit 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 vacuum purge pump and manifolding are also 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 fans at the rear of the base unit draw cooling air through a replaceable filter element to cool the power control units and transformers.

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. 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/hoist assembly is assembled onsite after delivered and uses a 1 ton motor driven chain hoist assembly to lift the chamber well above the 80" loading work area. It incorporates 2 safety chains so the operator is protected when working under the bell. The hoist itself is chain driven with a brake on the electrical drive motor, and cannot inadvertently lower on the removal of power. Its 2 speed motor allows for slow and fast operation and switches back and forth at 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 1200 deg. C. are achieved using type “K” Chromel / Alumel thermocouples. There are 3 thermocouples in close proximity to the 3 element zones, ensuring 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 appropriate proportional drive signals to the SCR power controllers. Totally automatic time/temperature programmed control of up to nineteen different, 19 segment programs may be stored. Computer controls are also used

Over temperature, Safe Access and Load Monitoring

Load temperature monitoring is provided by a several thermocouple located within close proximity to the load. These thermocouple drive provide digital readout of the load area temperature and also provides an over temperature shutdown signal. The process monitor also provides a safe chamber access interlock to protect the operator and equipment.

A thermocouple feedthrough at the bottom of the chamber and related holes in the bottom shields allow for additional survey thermocouples to be inserted to monitor actual temperature of load. These thermocouples can be used in conjunction with the cascade control system (Computer controls option only)

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 1200° C (2200° F).

Operation

The work is loaded onto the 18” diameter hearth plate and the chamber is lowered via the hoist switch. One of nineteen selectable, user programmed thermal profiles is chosen, and the “start” key pressed. A one button push will start the run and automatically it will vacuum purge, cross over to high vacuum, ramp to temperature and soak, activate the Argon partial pressure gas (when applicable), cooldown and post purge. Upon completion of the cooldown portion of the program, the chamber is opened and unloaded.

Chamber/Furnace assembly

The water-jacketed chamber bottom end is mounted on the base unit. It is sealed in operation to the chamber by a flange containing a silicone “O” ring. 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 feedthroughs and gas admission and exhaust plumbing. It supports the Molybdenum hearth and bottom end stack of eight shields via the lower support structure.

The furnace chamber is located within the COLD WALL jacketed stainless steel chamber. It incorporates three Molybdenum heating element zones of six sections each supported by high alumina insulators. These surround the eighteen-inch diameter by 80” high work area. A series of five Molybdenum cylindrical heat shields and the top and bottom stack of eight shields surround the elements. This assembly is supported from the inner wall of the chamber.

In addition, the chamber includes the insulated water-cooled power feed throughs, control thermocouples, 3 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 3 digitally controlled SCR three phase power modules. These units are phase angle fired control, and include three phase current limiting made necessary by the strongly positive resistivity coefficient of the heating element. In the event of a power outage at higher temperature, the load temperature would drop to a level where a hard application of heat might thermally shock damage the parts. In this event, an abort relay will trip, and the program will resume and time out under process atmosphere without the application of heat.

Impedance match of the heating elements to the incoming power is accomplished through 3 conservatively rated 40 KVA transformers driven by this power module.

Atmosphere Control (optional)

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

Operator set flowmeters 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.

A bubbler column that will humidify the process gas to a dewpoint of up to 20 degrees C is standard. Higher dewpoint equipment, and heated bubblers are available.

Exhaust gas is routed through a check valve and out a fitting at the rear of the cabinet. This valve establishes a slight positive pressure when the chamber is closed and sealed. As a safety feature, absence of this pressure prevents admission of hydrogen and inhibits the application of heater power. An exhaust gas burnoff 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 assures that heating power is removed from the furnace in the event of sensor failure. Overtemperature indication is read on a separate control module from the monitor thermocouple. This overtemp alarm causes the heating elements to shut down as a further backup.

Other numerous interlock functions protecting the operator and equipment include:

- Panel Interlock
- High Cabinet Temperature
- Low Coolant Flow
- Low Gas Pressure Switches
- Low vacuum alarms
- Vacuum delay in case of excessive out gassing during heating
- Hoist limit switches and dual safety chains.

Documentation

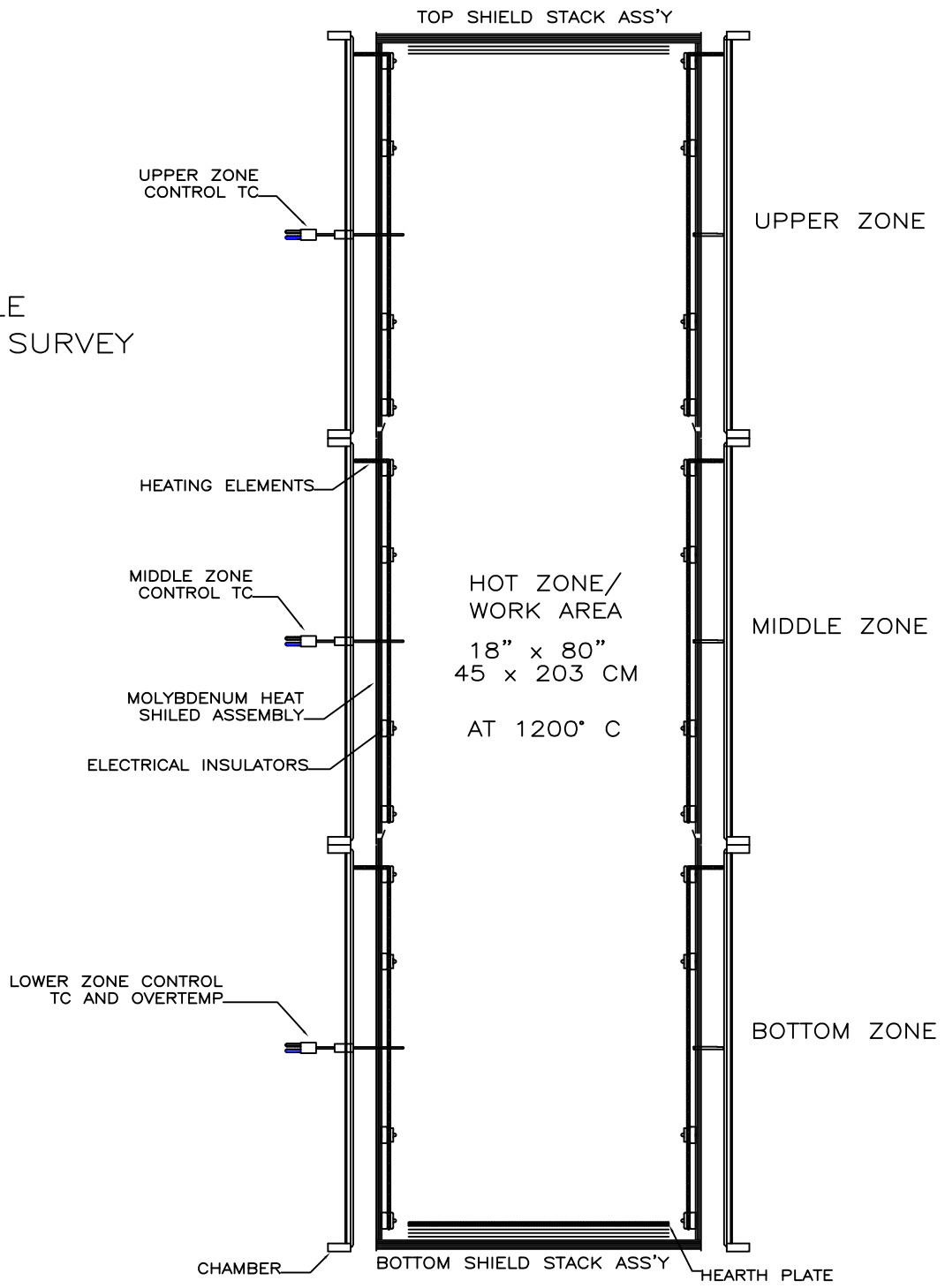
Facilities information is supplied to assist in site preparation for installation. An operating manual is supplied with the equipment. Worksheets included in the manual provide a convenient form to depict the desired process for entry into the microprocessor controller. The worksheets also serve as a 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. The relatively simple operation of the furnace is well described and documented in the manual.


REV.	DATE	DESCRIPTION

J-12-18X80 HOT ZONE
HYDROGEN OR HIGH VACUUM

UP TO 10 FLEXIBLE
TYPE "K" PART / SURVEY
THERMOCOUPLES



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		TOL'S EXCPT AS NOTED	DRN.BY: PAB	 Concepts & Methods Company, Inc.
		fract. ±1/32	APP.BY:	
		.XX ±.010	DATE: 1-9-15	
J-12-18X80	565	.XXX ±.005	MAT: NOTED	
USED ON TASK	FWO	.XXXX ±.0005	FINISH:	
		ANGLES ±1/2°		TITLE: J-12-18X80 HOT ZONE
				DWG.NO: 89631
				SHEET OF
				REV:



REV.	DATE	DESCRIPTION

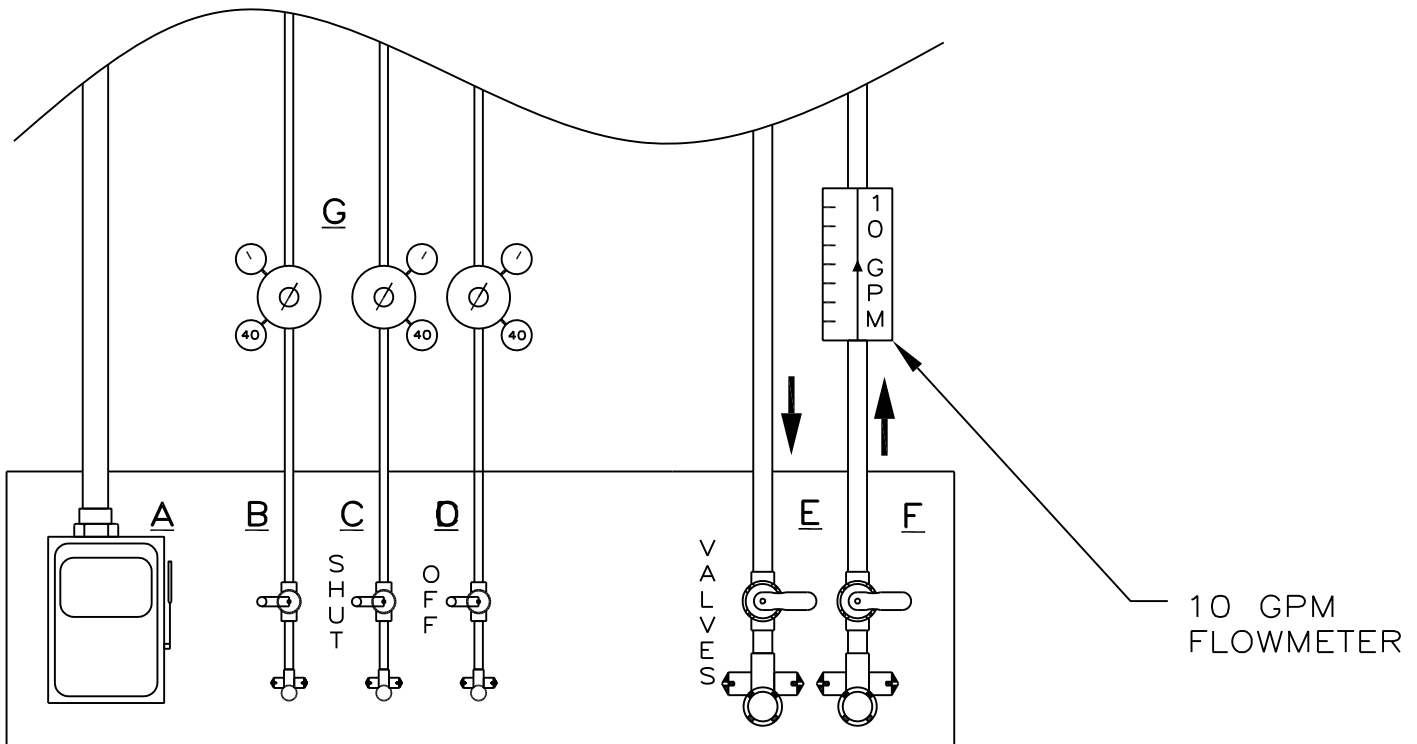
UTILITIES: PREPARED AS SHOWN BY CUSTOMER.

CONNECTIONS AT FURNACE

- A: 180A./LEG-@480V, 60Hz 3 PH DISCONNECT
- B: NITROGEN, 30-50 PSI AT A MAXIMUM FLOW OF 50 SCFH
- C: ARGON, 30 TO 50 PSI AT A MAXIMUM FLOW OF 30 SCFH
- D: CDA - CLEAN DRY AIR 80-100 PSI
- E: COOLING WATER SUPPLY; 40 PSI MIN. AT 8 GPM
- F: COOLING WATER RETURN.
- G: LINE PRESSURE REGULATORS SET AT 35 PSI (EXCEPT D)

- 1/4" SWAGELOCK (6mm)
- 1/4" SWAGELOCK
- 1/4" SWAGELOCK
- 3/4" FPT
- 3/4" FPT

NOTE: (MAX. BACK PRESSURE 25 PSI AT 30 LPM)



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
HEAT LOAD CALCULATED AT 120,000 btu (10 TON) AT FULL POWER.

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		TOL'S EXCPT AS NOTED	DRN.BY: T BARULICH		
		fract. ±1/32	APP.BY:		
		.XX ±.010	DATE: 4-29-14		
		.XXX ±.005	MAT: NOTED		
J-12-18X80	565	.XXXX ±.0005	FINISH:	TITLE: J FURNACE FACILITIES PREP 18X80	
USED ON TASK	FWO	ANGLES ±1/2'		DWG.NO: 89650	SHEET 1 OF
				REV:	