



CONTINUOUS VACUUM FURNACES

The C.I. Hayes “CV” Continuous Vacuum Series belongs to a family of vacuum furnaces comprised of modules including loading, heating and quenching. The modular and, in this case, continuous premise is to index small lots in a continuous automatic fashion that combines high production with superior product quality. Processing of small lots allows for tighter temperature uniformity within the work area, as well as similar thermal profiles within the work lot – center to edge. To further increase part quality, the heat chamber module of the “CV” is not thermally cycled. It remains at temperature and under vacuum during production, not exposed to room air except for routine maintenance needs. The modular heat chamber is consequently an extremely pure environment that contributes to the part quality.

Designs of the modular “CV” vacuum furnace can produce up to 1500 lbs/hr (680 kg/hr) reaching temperatures up to 2600°F (1427°C). The “CV” furnace is capable of many processes, including annealing, brazing, hardening, carburizing and sintering.

Load/Evacuation Module

The load/evacuation module is positioned in front of the heating module. It is designed to receive work at atmospheric pressure and then pull a vacuum. Once this module reaches the same vacuum level as the heating module, an internal door is opened to allow a transfer of the work to occur. The load module is mounted to a structural steel frame supported on wheels, which allows access to the heating chamber for ease of maintenance.

Heating Module

The heating module can be provided with multiple work positions typically ranging from one to four. High purity graphite material backed by high purity ceramic material form the actual heating chamber. This module is designed to remain under vacuum and at process temperature during production mode. Alternatively, when not in production mode, the heating module may be turned off though kept under vacuum. Service life and part quality are consequently maximized.

Quench Module—Pressure or Oil

The quench module may be designed for gas cooling of parts, and/or it may be designed for oil cooling of parts. The gas is recirculated within the module by a high-powered fan that pulls the gas through the workload and past an internal heat exchanger. As the quench module is isolated from the heating module by an internal sealed door, only the workload is cooled. Alternatively, an oil quench module may be provided. It includes an elevator mechanism, directional oil agitation surrounded by a water-jacketed cylindrical tank.

Heating Elements

The heating module is provided with solid graphite resistive elements. The elements, located above and below the work area, are machined to a matched resistance and provide for optimum heating and temperature uniformity. They may be arranged to create one to four zones of temperature control.

Vacuum Pumping System

On account of the high purity level and low dewpoint attainable within the isolated graphite heating module, a single rough pump is typically all that is required to produce high quality work. Each module has its own vacuum valve that allows its pressure or vacuum level to be independently regulated.

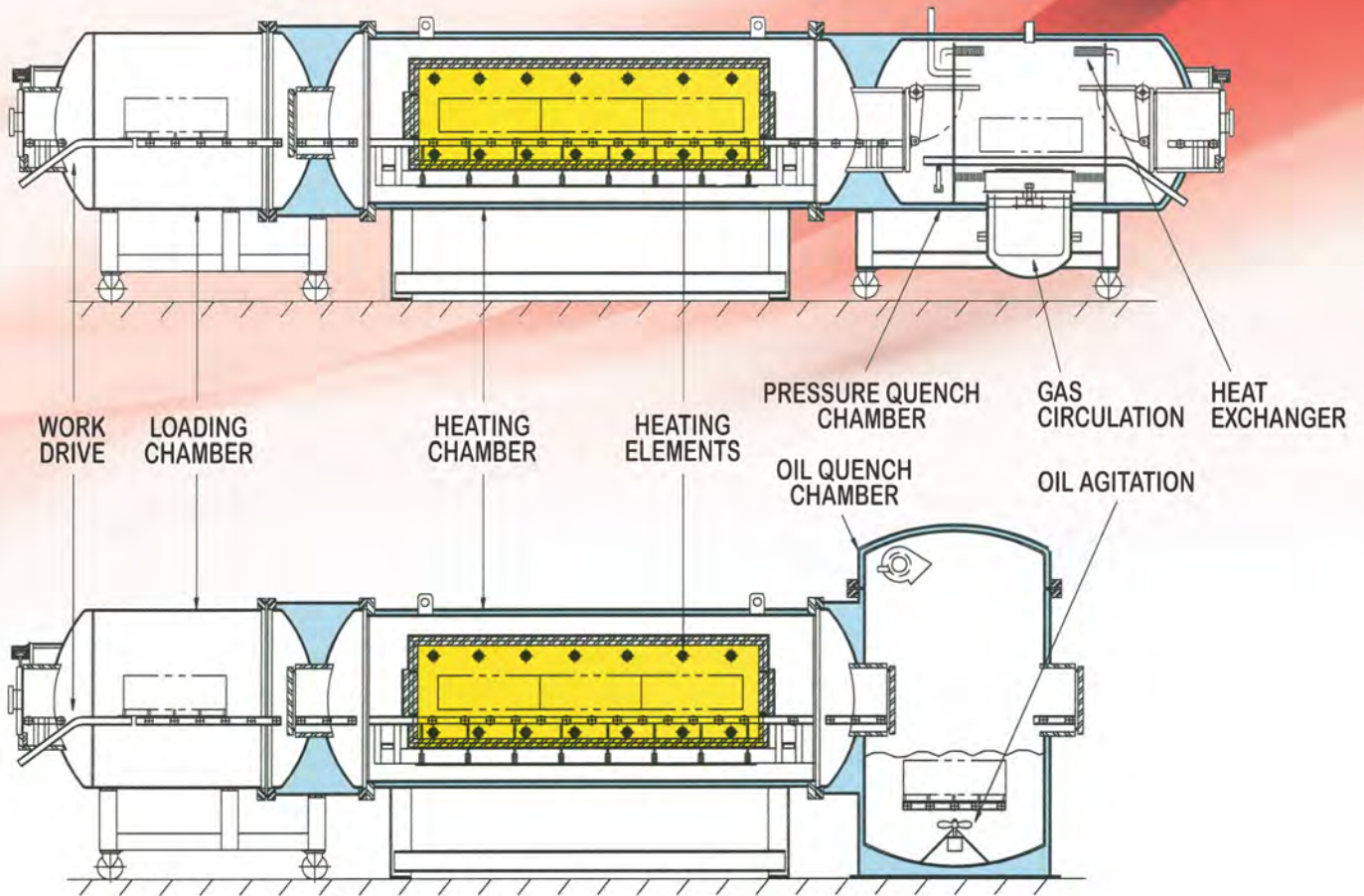
Work Automation System

Work is transferred through the furnace modules on high strength roller rails via hydraulic pusher and puller mechanisms. The work is carried on either machined cast or fabricated grids, dependent upon whether the process requires gas or oil quenching.

Control and Graphical Computer Interface

The coordination of the work transfer, zone temperatures, furnace sequencing and data collection is by an integrated control system. It mainly consists of a logic controller (PLC) and a GCI operator touchscreen from which recipe downloading, data acquisition, trending and system diagnostics can occur.

SPECIFICATIONS



Models:	CV-060842	CV-091824	CV-091896	CV-202436	CV-2024144
Heat Chamber Work Size (H x W x L)	6" x 8" x 42" 152mm x 203mm x 1066mm	9" x 18" x 24" 228mm x 457mm x 609mm	9" x 18" x 96" 228mm x 457mm x 2184mm	20" x 24" x 36" 508mm x 6009mm x 914mm	20" x 24" x 144" 508mm x 609mm x 3657mm
No. Tray Positions	3	1	4	1	4
Net Production ¹	110 lb/hr (50 kg/hr)	150 lb/hr (65 kg/hr)	560 lb/hr (255 kg/hr)	280 lb/hr (130 kg/hr)	1000 lb/hr (455 kg/hr)
M.O.T.	Up to 2600°F (1427°C)	Up to 2600°F (1427°C)	Up to 2600°F (1427°C)	Up to 2600°F (1427°C)	Up to 2600°F (1427°C)
Uniformity ²	25°F (14°C)	25°F (14°C)	25°F (14°C)	25°F (14°C)	25°F (14°C)
Element Power ³	51 KW	60 KW	120 KW	120 KW	300 KW
Auxiliary Power ³	10 KW	42 KW	66 KW	75 KW	75 KW
Cooling Water ⁴	17 GPM (65 LPM)	21 GPM (80 LPM)	42 GPM (160 LPM)	42 GPM (160 LPM)	100 GPM (379 LPM)
N ² Backfill: Load Chamber	20 ft ³ (0.6 m ³)	60 ft ³ (1.7 m ³)	60 ft ³ (1.7 m ³)	200 ft ³ (5.7 m ³)	200 ft ³ (5.7 m ³)
Quench Chamber ⁵	25 ft ³ (0.7 m ³)	90 ft ³ (2.6 m ³)	90 ft ³ (2.6 m ³)	300 ft ³ (8.5 m ³)	300 ft ³ (8.5 m ³)
Approximate Floor Space (H x W x L)	6' x 7' x 25' (1.8m x 2.1m x 7.6m)	8' x 11 x 32' (2.5m x 3.4m x 9.8m)	8' x 11' x 42' (2.5m x 3.4m x 12.8m)	10' x 14' x 40' (3.1m x 4.3m x 12.2m)	10' x 14' x 60' (3.1m x 4.3m x 18.3m)

1 Typical based on 60 min. dwell time in the heat chamber

2 Maximum spread: 1600°F-2600°F (871°C-1427°C)

3 460 Volts, 3-Phase, 60 Cycle with single point connection

4 Average GPM at 80°F with a rise of 20°F (Average LPM at 27°C with a rise of 11°C)

5 Quantity at atmospheric pressure (1 BAR)

	Sinterite	C.I. Hayes	J.L. Becker
Continuous Belt Furnaces			
Sintering Furnaces	A	A	A
Brazing Furnaces	A	A	A
Steam Treat Furnaces	A		A
Annealing Furnaces	A	A	A
Austempering Furnaces			A
Normalizing			A
Stress Relief Furnaces			A
Tempering Furnaces	A		A
Mesh Belt Furnaces			A
Solid Belt Furnaces	A		
Cast Link Furnaces			A
Humpback Conveyor Furnaces	A	A	A
Other Continuous Furnaces			
Pusher Furnaces (2000°-3000° F)	A	A	
Pusher Furnaces (below 2000° F)			A
Roller Hearth			A
Walking Beam		A	A
Vacuum Furnaces			
Continuous & Modular		A	
Batch		A	
Integral, Gas, Pressure & Oil Quench		A	
Batch Furnaces			
Sintering Furnaces	A	V	
Carburizing Furnaces		V	A
Carbonitriding Furnaces			A
Normalizing Furnaces			A
Spheroidize Annealing Furnaces			A
Stress Relieving Furnaces			A
Brazing Furnaces	A	V	A
Annealing Furnaces	A	V	A
Tempering Furnaces	A	V	A
Box & Slot Furnaces (above 2000° F)			A
Steam Treat Furnaces	A		
Bell (Carbon) Furnaces	A		
Quenching Furnaces			A
Tip-Up Furnaces			A
Atmosphere Tip-Up Furnaces			A
Tempering Pit Furnaces			A
Carburizing Pit Furnaces			A
Nitriding Pit Furnaces			A
Car Bottom Furnaces			A
Tool Room Furnaces	A	V	
Atmosphere Generators			
Exothermic Gas up to 3000 CFH		A	A
Exothermic Gas up to 20000 CFH			A
Endothermic Gas up to 12000 CFH			A
Ammonia Dissociators up to 10000 CFH		A	A
Atmosphere Dryers		A	A
Quench Systems		V	A
Parts Washers			•
Charge Cars	•		•
Fabrications	•		•
Automation	•		•
Vacuum Impregnators	•		
Accelerated Delubrication Units	•		
Sinter Hardening/Accelerated Cooling Units	•		
Powder Handling Equipment	•		
Powder Blenders	•		
500# Barrel Dumpers	•		
Bulk Pack Inverters	•		
Powder Bag Hangers	•		
Furnace Load/Unloaders	•	•	•
Rebuild Services	•	•	•
Spare Parts	•	•	•
Training	•	•	•
Field Service	•	•	•

KEY
 A: Atmosphere
 V: Vacuum