



MIM

AM

WC

HT

## Full Series Debinding and Sintering Furnace

2020

### Full Series Debinding and Sintering Furnace

- Metal Injection Molding(MIM)
- Additive Manufacturing(AM)
- Cemented Carbide(WC)
- Heat Treatment(HT)

## Company Brief



\* Note: Locate in Cixi Emerging Industrial Clusters

**Ningbo Hiper Vacuum Technology Co.,Ltd** is the main manufacturer of sintering furnace in China, which has a reliable R&D team with rich experience to meet customer's requirements and create value for customers.

We are the MIM debinding and sintering furnace leadership in the world ,walking beam continuous debinding and sintering furnaces are delivered in mass.

Hiper also supply furnaces for cemented carbide, heat treatment, non-oxidized ceramics, additive manufacturing (AM), crystal growth, semiconductor, laboratory and other industries.

### Company Vision

Create the most value for customers,  
Keep and improve leading technology.

### Company Value

Honest, Integrity;  
Respect individual;  
Innovation on the base of technology.

MIM

Metal Injection Molding

## Graphite hot zone debinding and sintering vacuum furnace

PRO

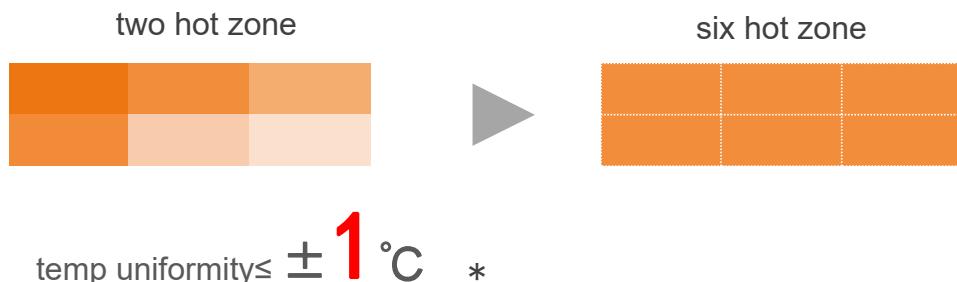
# Next Generation “PRO” Launched!

# World Best



There are decades to use conventional MIM vacuum furnace, Now it's time to change. The "PRO" furnace is completely different from the original design, and adopts innovative technology in hot zone, gas flow control, atmosphere control, AI, etc., which greatly improves the yield of MIM products.

## Break temp uniformity limit

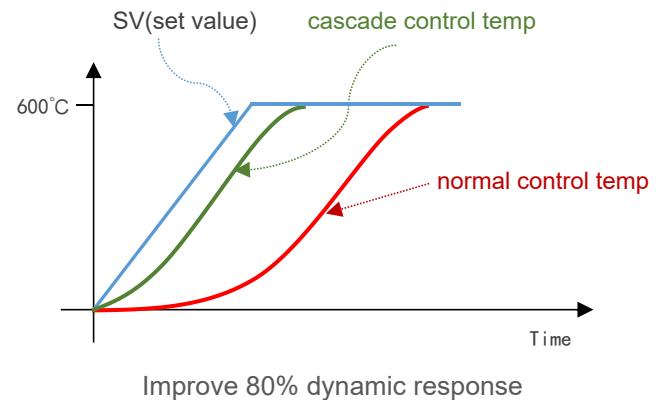
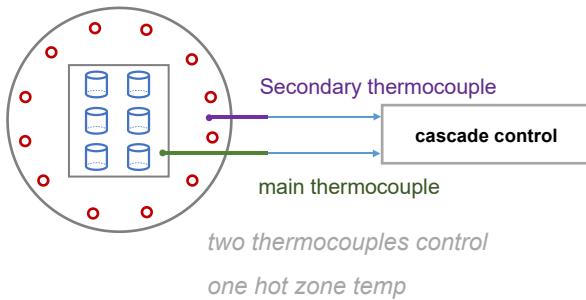


\*temp uniformity $\leq \pm 1^{\circ}\text{C}$ , measurement standard according to GB or AMS.

\*Temp uniformity calibrated by sintering samples.

## Temp cascade control

Now we know the real sintering temp !



Use Platinum thermocouple to improve temp accuracy.

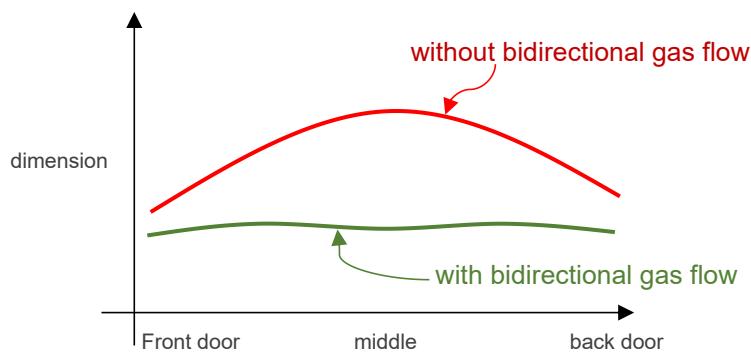
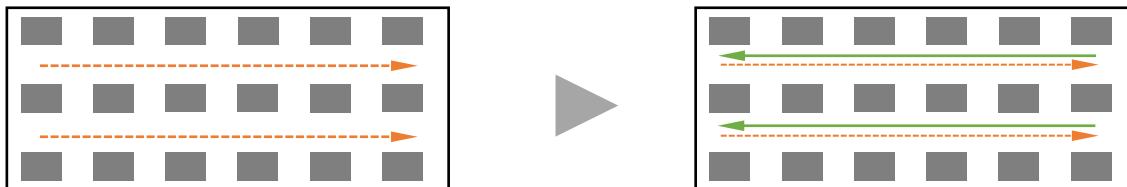
With spare thermocouples , auto switch to spare thermocouple if running thermocouple have problem. optional

*\*All these technology are patents*

Graphite hot zone debinding  
and sintering vacuum furnace

**PRO**

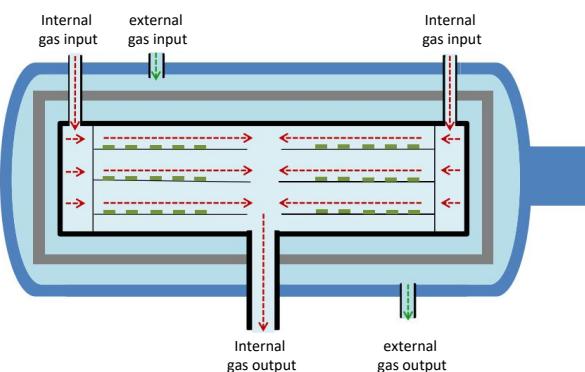
## « Bidirectional gas flow



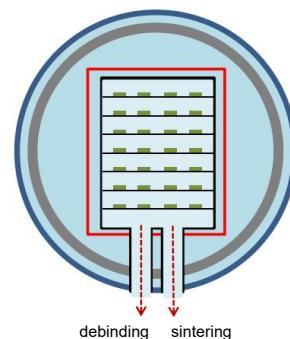
Gas flow from one direction to bidirection ,can improve the tolerance of stainless steel sintering,for large parts the tolerance improved by **80%\***

\*Data from [ZeroLab](#),please ask for detail.

## ☒ Separate Debinding & Sintering、Separate Atmosphere&Gas flow



Atmosphere and gas flow separated in and out of retort ,avoid furnace leakage to affect the products and improve the yield.



Debinding and sintering pipeline separated ,avoid the debinding pipeline affect sintering products.

optional

*\*All these technology are patents*

CREATE VALUE FOR CUSTOMERS

**TEAM**   
Industrial Furnace

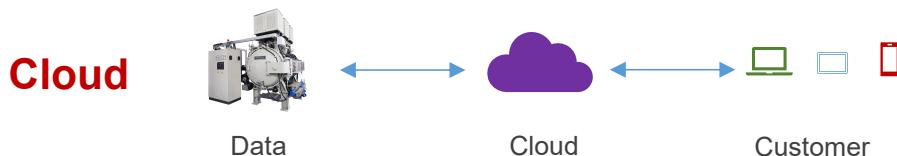
Graphite hot zone debinding  
and sintering vacuum furnace

**PRO**

 AI.SmartSinter

coming soon

## SmartSinter



\* Use Private cloud to make sure the data safety

### AI

The sintering process is automatically calculated by AI, using reinforcement learning, according to the results of each cycle, automatically calculate the next cycle sintering process parameters, for example: the maximum set temperature. AI learning instead of human experience, more reliability, stability, accuracy.

### SmartSinter

Processes are automatically generated according to powder type ,feedstock parameters, product size, weight and other parameters.

With the private cloud + AI system to make data online, intelligence and standardization.

 Sintered cases



**Material:** 316L

**Powder:** D50=10um(water atomization)

**Size:** 9\*9\*55mm

**Weight:** 27g

**Description:** Square、long、half hole

**Difficult:** Sintering dimension not uniformity because of half hole

Hiper old furnace

Tolerance: 0.4 mm

Variance: 0.1

Hiper Pro furnace

Tolerance: 0.08 mm

Variance: 0.02

*\*All these technology are patents*

Graphite hot zone debinding  
and sintering vacuum furnace

PLUS

New “PLUS” launched

Capacity up **30%** \*

Temp uniformity  $\leq \pm 2^{\circ}\text{C}$  \*

\*compare with old hiper furnace.

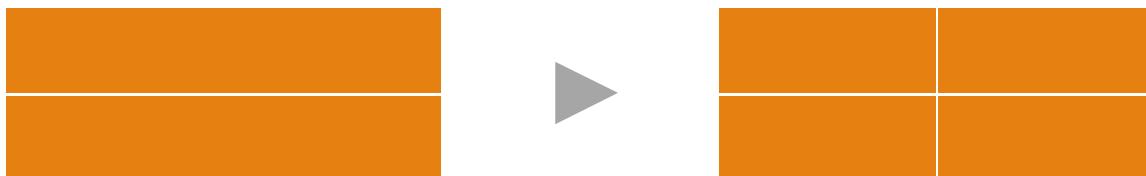
\*measurement method according to GB or AMS.



“PLUS version” adopted new hot zone design, big capacity  
with competitive price.

## 4 Hot zone temp control

4 hot zone temp control with  $\pm 2^{\circ}\text{C}$  temp uniformity to make sure sinteirng results.



## Two cores thermocouples

Two cores thermocouples, one spare in case thermocouple have problems.

## High configuration

Use Japanese or German hard felt insulation graphite and parts.

Standard configuratton with closed water system.

High performance module optional.

\*All these technology are patents

## Graphite hot zone debinding and sintering vacuum furnace

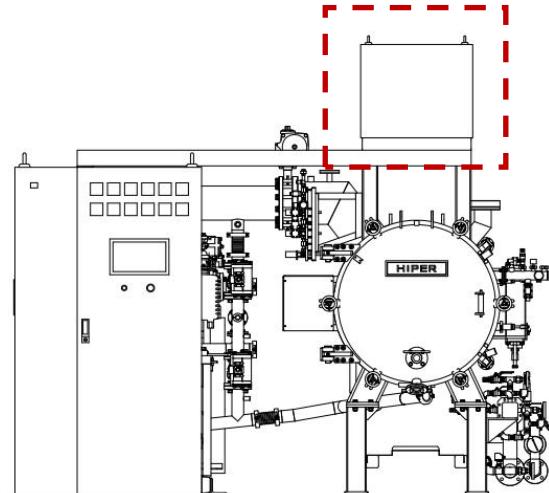
Standard

### ■ Small Area

By adopting three-dimensional design and placing heat transformers on the top of furnace body, as well as the systematic design of cooling water , furnace body and pipeline for pump sets, it reduces the occupation area by 30% .

### ■ High Configuration

- Using German and Japanese material for thermal insulation and graphite heater.
- Employ valves of German and Japanese brand .
- American thermocouple, Japanese vacuum gauge and Denmark pressure transducer.
- All-around innovated temperature control system and man-machine interface



Transformers up

Patent

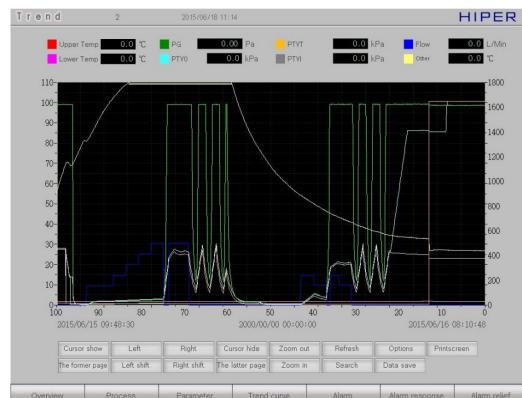
### ■ Binder Trap and Vacuum Pump Oil filter

- 3 grade binder trap design. More efficient.
- First grade is stainsteel,second grade is aluminum, third grade is copper.
- Binder trap and vacuum pump oil filter, integrated design enhance effective filtration.



### ■ Real Time Curve

- Choose the pipeline to record.
- Supply the real time curve and history curve.
- Open Data Viewer on computer.



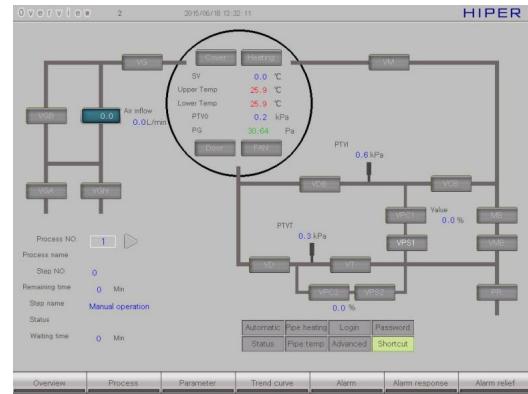
Graphite hot zone debinding  
and sintering vacuum furnace

Standard

## ■ Simple Operation

Adopt 15" man-machine interface, instead of separate instrument control, it is reformed into centralized control with data input, Operation and recording control.

- Automatic run to regulate pressure and gas flow.
- Automatic vacuum leakage detection of furnace body and pipeline .
- Record both real time alarm and history alarm.
- Automatic adjust and process at different-grades of alarm.
- Combine input processon temperature ,gas flow and pressure.
- Two operation authorization:level 1 and level 2.
- Remote control.



## ■ Process Input

- Save up 50 processes (with eath 40 steps).
- Simple operation.
- Automatic check the process.



## ■ Data Viewer

Develop "Data viewer" in computer to check the curve run of the furnace .easy to move ,print and zoom to track on malfunctions.



Graphite hot zone debinding  
and sintering vacuum furnace

Standard

## ■ High Precision Gas Control

Patent

- Mass flow controller can automatically adjust flow according to the process setting, avoid unstable air intake flow (fluctuation ratio of 20~50%) due to the change of parameter such (e.g. pressure) when using rotor flow meter.
- Gas flow can be set continuously according to process steps.
- Two alarms outputs (Warning and action) for each process gas.
- Devices to maintain pressure stabilization in pipeline, so as to prevent process gas leakage, backflow and mix up.



## ■ Partial Pressure Control

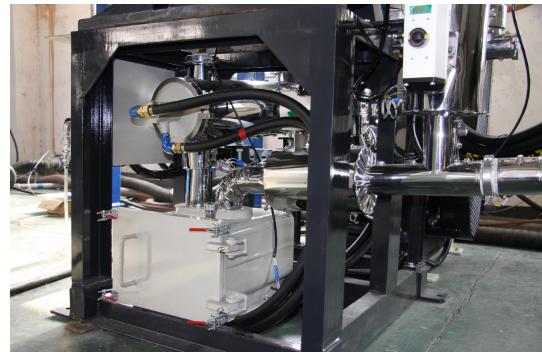
Patent

- Deploy Siemens electric proportional controller to automatically regulate pressure inside the furnace according to process parameters, to avoid the fluctuation, area pressure difference, valve leakage, etc. when using open-shut type of control.
- The pressure can be set continuously according to process steps.



## ■ Optimized Design of Vacuum Pipeline

- Deploy binder collecting-pot with front opening-door, for easy binder and seal cleaning to reduce leakage, and design without plug-in and pull-out cable for heating.
- Low position of pipeline, for convenient cleaning and maintenance.



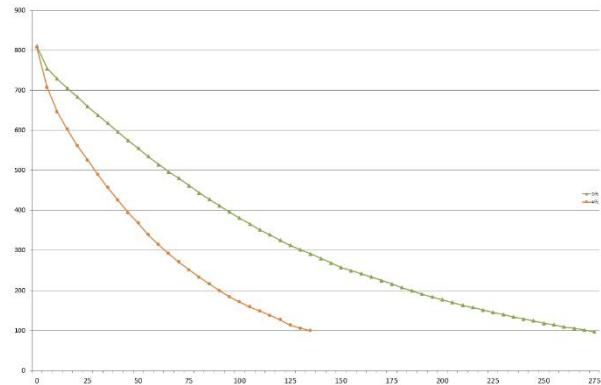
Graphite hot zone debinding  
and sintering vacuum furnace

Standard

MM

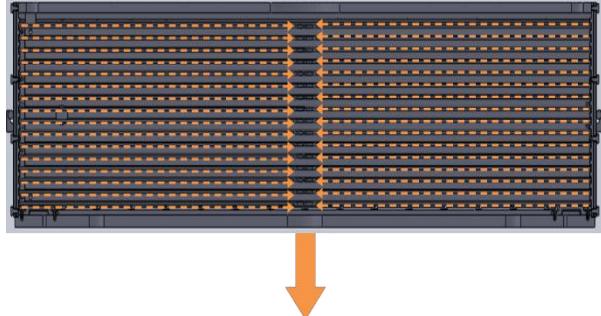
## ■ Fast Force Cooling

- Added built-in copper cooler in the back door.
- The cooling fan is changed from 2.2kW to 7.5KW (15kW).
- The cooling time of unloaded furnace improved by more than 60%.
- The cooling time of loaded furnace improved by more than 50%.
- By using loaded furnace and controllable cooling cooperatively, the actual whole production cycle time can be reduced by 15~25%.



## ■ Wide Directional Gas Flow

- Refined gas flow, there are many holes in the door face to the shelves, the gas from holes flow into the retort.
- The gas can flow through the product uniformly, forming positive flow no matter in debinding or partial pressure process.
- With independent air intake for each shelf, to guide the gas uniformity into each shelf.
- With equally-distributed air inlets and pipeline spreader plates, ensuring the wide cut of gas.
- The gas is fed into the furnace first, and then flows through the inlet valve at the graphite seal box door and the diversion branch, as well as the inlets to flow into the seal box evenly.



## ■ Innovate High Seal Retort Patent

- Innovative design, to avoid malposition of graphite box in the long term.
- Upside down type integrated design of the seal box door, and the door with two bolts structure.
- Debinding pipeline with anti leakage ring.

Metal hot zone debinding  
and sintering vacuum furnace

## New upgrade

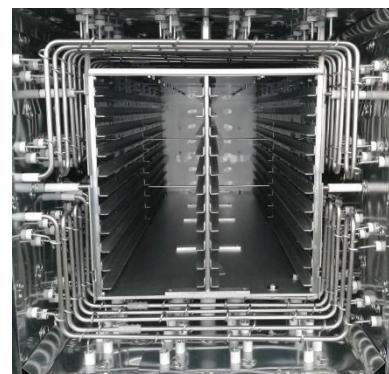
### ■ Metal hot zone debinding and sintering vacuum furnace

- Deeper ultimate vacuum.
- Clean sintering atmosphere.
- Safety system design.
- six hot zone temp control ,better temp uniformity.
- Can use H<sub>2</sub> sintering
- Can sinter Ti,Cu,Al,W new material .



### ■ Higher ultimate vacuum

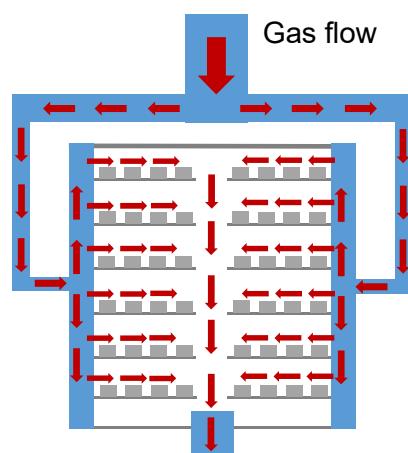
- Increase pipeline diameter and with two diffusion pumps to get deeper ultimate vacuum.
- With super refrigerator to catch moisture in -130,to make sure the gas purity.
- Double seal structure with vacuum system, reduce leakage rate.



### ■ Short Range and Wide Gas Flow

Patent

- Pre-heating gas chare in .
- Two side gas flow intake design.
- Gas flow intake uniformity.
- Temperature vacuumized in the middle, guide the gas flow through every product ,and flow out from below pipeline .



## Walking beam continuous debinding and sintering furnace

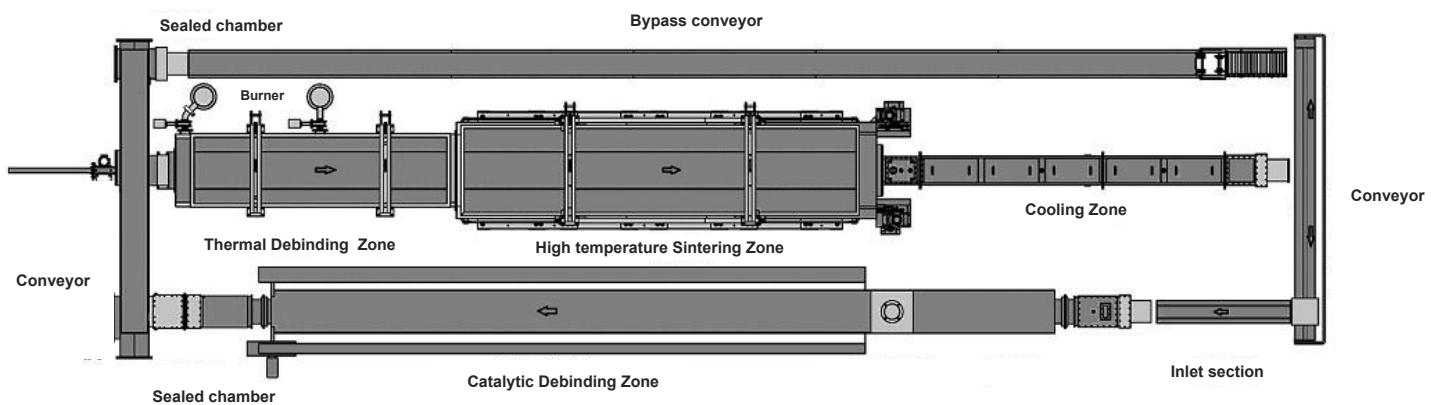
HIPER proudly presents "ALL-IN-ONE" continuous MIM Debinding and Sintering Furnace, The need for producing high quantity MIM parts, can be only achieved by top quality and reliable equipment. Sintering is the most critical step in the MIM process.



The "Walking Beam" continuous MIM Debinding and Sintering Furnace, consists of Inlet section, Outlet section, Catalytic Debinding section, thermal debinding, high temperature sintering zone and the cooling zone .

In the Catalytic Debinding Zone, green parts are placed in trays and nitric acid vapor is designed to flow in a counter direction of the trays to maximize the debinding efficiency.

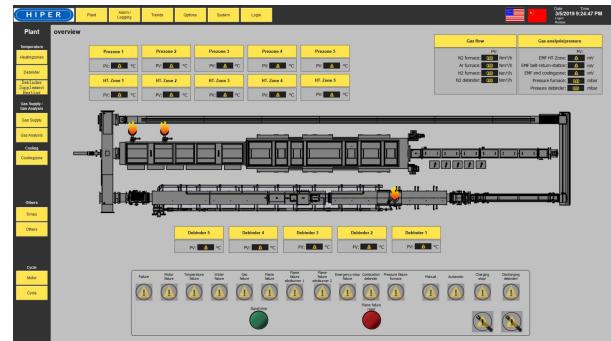
In the thermal and high temperature zone the tray is transferred by the vibration free Walking Beam mechanism.



## Walking beam continuous debinding and sintering furnace

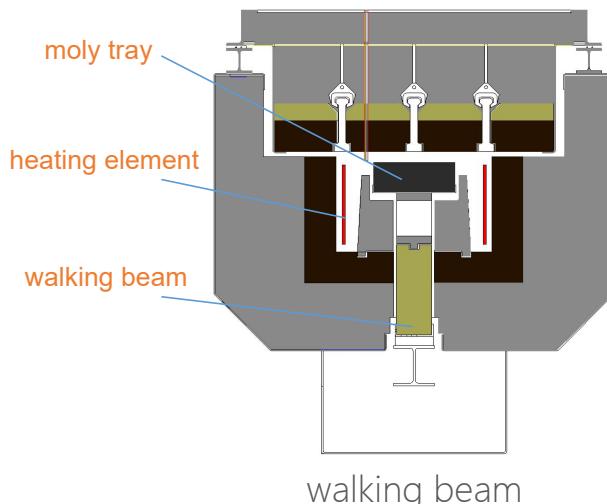
### ■ High Productivity

- Debinding and sintering as 2-in-1.
- Improved debinding efficiency, by new debinding gas circulation design.
- Productivity is 8-10 times higher, compare to standard Batch Furnace.
- Short sintering cycle, low utility cost and stable quality.
- Better for large quantity and consistent products.



### ■ High stable

- Walking Beam Steel from Germany.
- Siemens made in Germany controlling system for all mechanical motion.
- All temperature, valves, Burners and pressure controls are in German system.



### ■ High configuration

- All Insulation bricks, fire bricks, Sealings etc imported from Germany.
- The High heat Molybdenum Heating Elements are from Plansee Austria.
- Mesh Belt for debinding and cooling zone, Gas flow controller, Solenoid valves, Control panel Switches etc. are from Germany or Europe.

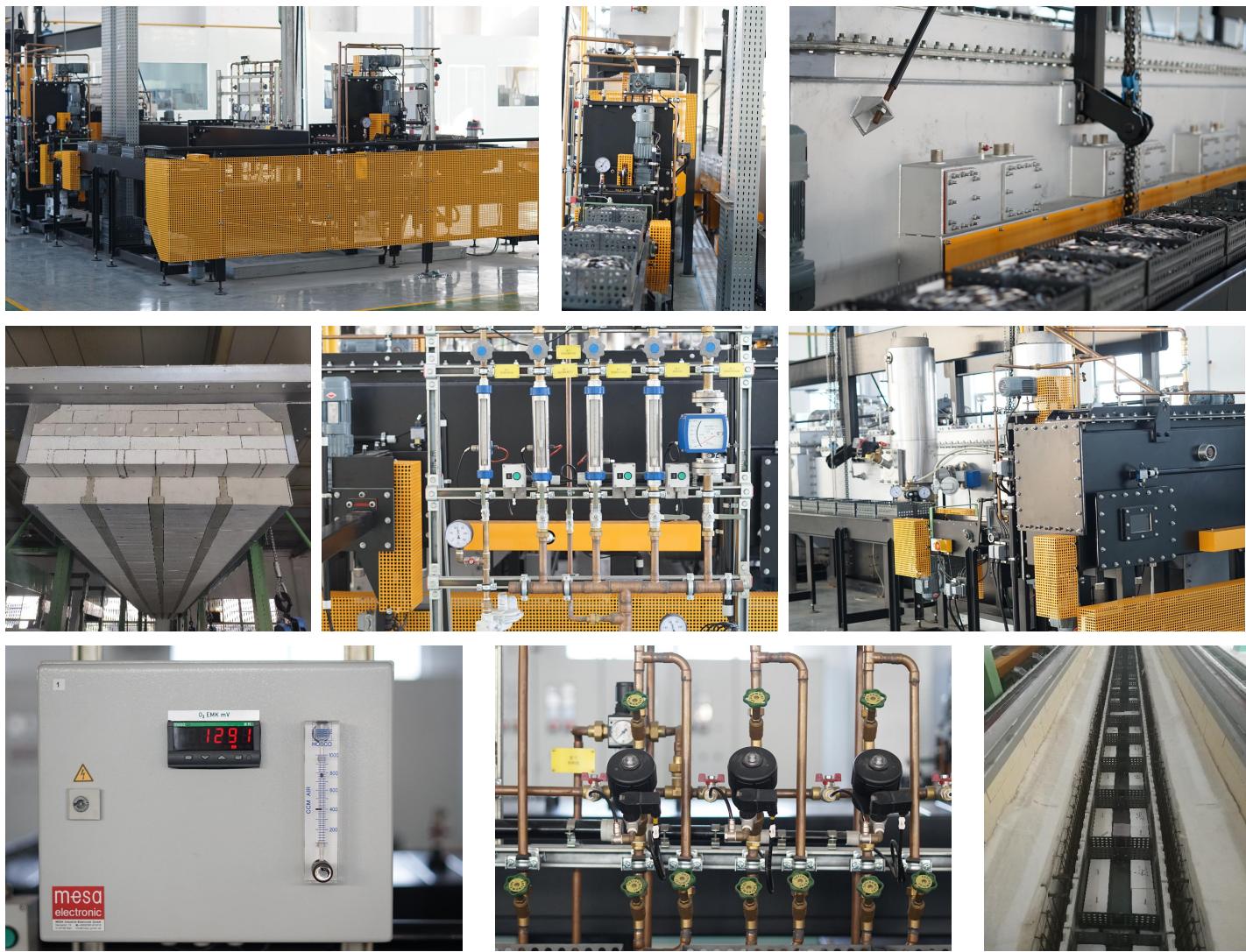


Walking beam continuous  
debinding and sintering furnace

The all new HIPER “ALL-IN-ONE” Continuous MIM Debinding and Sintering Furnace, achieve this goals by

- Using only the best and well known brands and parts.
- German made high quality steel, for the vibration free “Walking Beam”, to ensure the stability in high temperature operation.
- The combination of High tech German and European Parts assembled from professional and Skilled Chinese workers.

MIM



**“ALL-IN-ONE” Walking Beam Continuous Debinding and Sintering Furnace**

\* the specification of continuous furnace at last page

\* customize continuous furnace available

CREAT VALUE FOR CUSTOMERS

TEAM  
Industrial Furnace

## ■ Metal hot zone debinding and sintering vacuum furnace

		VM30/30/60	VM42/45/125
Retort size	mm	300X300X600	420X450X1250
Shelves qty	pcs	18	88
Max temp	°C		1600
Operation temp	°C		1550
Temp uniformity	°C		≤6 (±3)
Ultimate vacuum	Pa		7X10 <sup>-4</sup>
Power capacity	KVA	170	410
Used gas		N2,Ar,H2	
Equipment size	m <sup>3</sup>	4.2X2.6X2.4	5X3X3

## ■ Walking beam continuous debinding and sintering furnace

		CM6XL	CM8XL	CM9XL-PRO
Speed	tray/h	6~7	8~10	8~10
Tray qty	pcs	105	120	160
Tray size	mm <sup>2</sup>	330X330	330X330	330X330
Max tray height	mm	90(120)	90(120)	180(240)
Max sintering temp	°C		1450 (1600)	
Temp distribution	°C		≤3 (±1.5)	
Power capacity	KVA	530	600	900
Used gas		N2,H2,Ar,H2/N2 mix,Natural gas,Ammonia decomposition		
Equipment size	m <sup>3</sup>	25X7.5X4.6	28X7.5X4.6	35X8X4.6
Cabinet Size	m <sup>3</sup>	8.4X0.6X2.1	8.4X0.6X2.1	11X0.6X2.1

## Graphite hot zone debinding and sintering vacuum furnace

	240-S	480-S	300-PLUS	600-PLUS	240-PRO	600-PRO
Version	standard		Plus		professional	
Hot zone	2		4		6	
Gas flow	one direction gas flow			bidirection gas flow		
Retort size mm	400X400X1500	480X480X2000	400X500X1600	500X650X2000	400X400X1500	500X600X2000
Shelves qty pcs	32	40	38	48	32	44
Max temp °C	1600					
Operation temp °C	1550					
Temp uniformity °C	≤6 (±3)		≤4 (±2)		≤2 (±1)	
Ultimate vacuum Pa	7X10 <sup>-1</sup>					
Power capacity KVA	150	200	190	240	150	290
Used gas	N <sub>2</sub> ,Ar				N <sub>2</sub> ,Ar,H <sub>2</sub> Mix	
Equipment size m <sup>3</sup>	3.5X4X2.9	3.6X4.6X3.1	3.6X4.5X2.9	3.6X4.8X2.9	3.5X4X2.9	3.7X4.7X3.3

m<sup>3</sup>

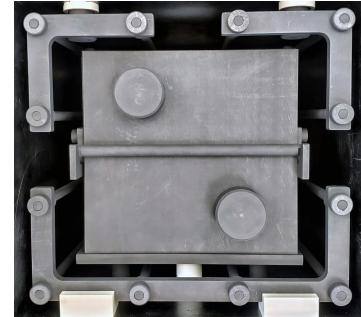
# AM

Additive Manufacturing

## Debinding and sintering vacuum furnace

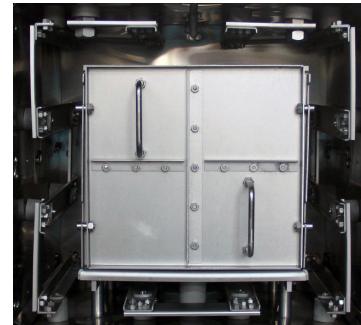
### Advanced Functions

- Automatic door and locking system.
- Special Negative pressure debinding and partial pressure sintering (N<sub>2</sub> or Ar). for most material without H<sub>2</sub>(e.g.stainless steel 、 Fe-based).
- Ti sintering in high vacuum or in Ar.
- Optional H<sub>2</sub>, with double ceramic heating elements ,no natural gas involved. Built-in safety valve and emergency gas purging system.



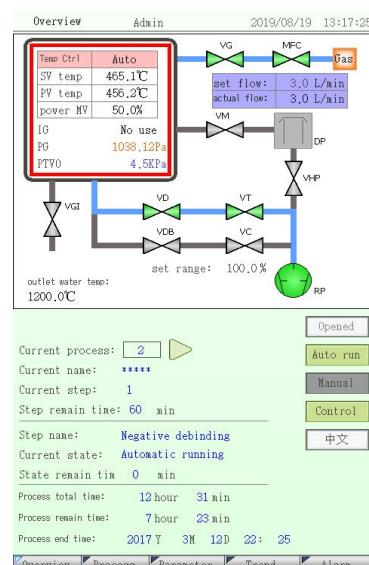
### Vacuum Furnace

- Debinding and sintering ,2 in 1 process.
- Heat treatment for metal laser printing (normalizing, tempering and annealing).



### Easy operation

- Automatic run system for easy handling.
- Touch Panel for Data Input and Display.
- Process input with pressure ,gas flow and automatic check.
- Easy process with Automatic check on Temperature, Pressure and Gas Flow.



### Fit for lab

- Integrated Design for limited area.
- Easy for transport and relocation.
- Optional with or without H<sub>2</sub>, N<sub>2</sub> or Ar.

R&amp;D center

# ZeroLab



## ■ Application

- AM research center (with binder jet, filament, feedstock printer).
- Research on debinding, sintering and heat treatment.
- Research on advanced material.
- Sintering analysis.

## ■ Detection (internal)

- Scanning electron microscope (SEM/EDS) .
- C、S、O、N analysis.
- Automatic metallographic preparation and analysis.
- Material character test.
- Automatic dimension measure instrument.
- Atmosphere component analysis (online) .
- Other normal test.

**“like MIM” metal printing technology.**

Support platform for future research !



Binder Jetting products and sintered



Debinding and sintering vacuum furnace



Binder jetting printer

## ■ Vacuum debinding and sintering furnace for metal AM

	BJ-200GR	BJ-200MoR
Retort	Graphite	Molybdenum
Retort size mm	200X200X200*	200X200X200*
Shelf area m <sup>2</sup>	0.16	
Shelf qty pcs	4	
Max temp °C	1600	1500
Operation temp °C	1500	1450
Temp distribution °C	≤4 (±2)	
Ultimate vacuum Pa	20/9X10 <sup>-3</sup> (option)	
Power capacity KVA	30	35
Gas	N <sub>2</sub> /Ar/H <sub>2</sub> (option)	
Equipment size m <sup>3</sup>	1.4X0.9X1.77	

\* Please contact with sales for other dimension

## ■ Vacuum heat treatment furnace for laser printing

	HT-200GR
Retort size mm	200X200X200
Max temp °C	1600
Temp distribution °C	≤4 (±2)
Gas	N <sub>2</sub> /Ar
Equipment size m <sup>3</sup>	1.4X0.9X1.77

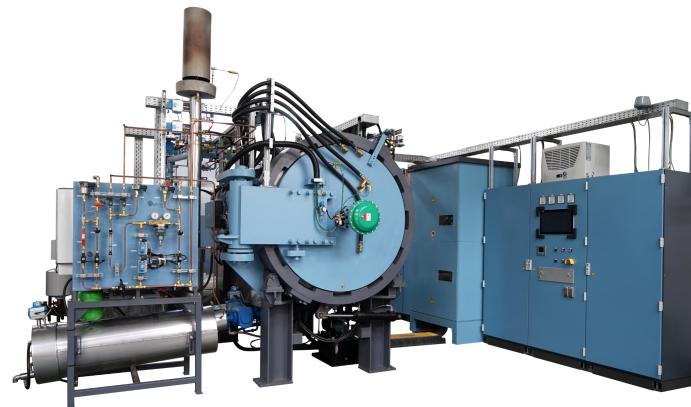
W C

Cemented carbide

## Pressure Sintering furnace

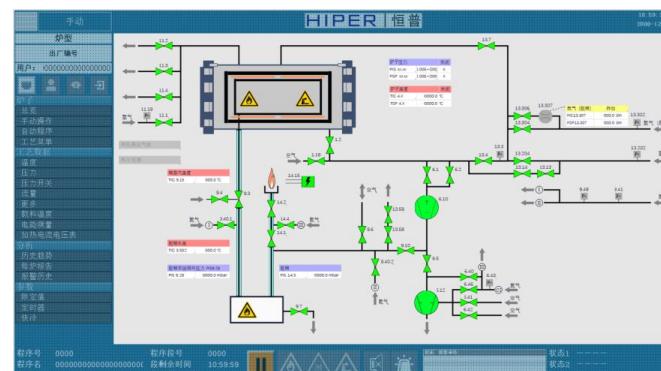
### ■ High performance

- Dewaxing、vacuum sintering and pressure sintering all in one.
- Negative pressure dewaxing,atmospheric pressure degreasing with H<sub>2</sub>, suitable for different kinds binder(Paraffins, waxes and PEGs, etc.)
- Fast cooling with high pressure gas.



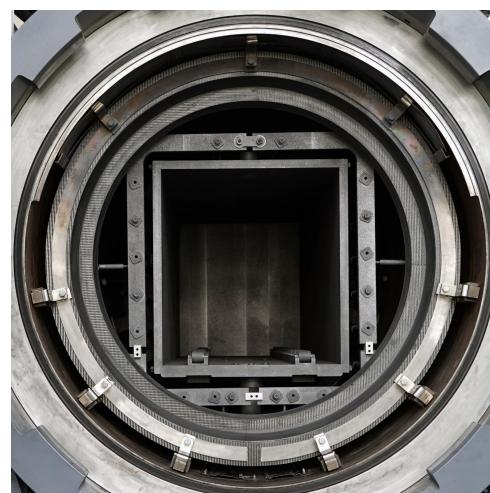
### ■ High stability

- Two hot zone temp control, gas pre-heated, hard-felt multi-layer insulation , to ensure temperature uniformity under vacuum and pressure.
- Make sure accurate temperature control with German temp control system
- Make sure accurate pressure control with German pressure control system.
- H<sub>2</sub> safety operation system.



### ■ High configuration

- German and Japanese graphite.
- German mass flow controller、pressure sensor、thermocouple.
- German dewax valve、pressure reducing valve、safety valve.
- German power controller.
- German SIEMENS control system.
- German RITTAL cabinet.
- German PREIFFER rotary vane pump and roots pump.



## ■ Pressure sintering furnace

	<b>PC30/30/125</b>	<b>PC62/72/300</b>	<b>PC50/54/150</b>	<b>PC50/54/240</b>
Retort size mm	300/300/1250	620X720X3000	500×540×1500	500×540×2400
Pressure bar	10	10	60	100
Max temp °C		1600/2200(optional)		
Operation temp °C		1550/2150(optional)		
Temp uniformity °C		≤±7		
Ultimate vacuum Pa		7X10 <sup>-1</sup>		
Gas		N <sub>2</sub> ,Ar,H <sub>2</sub> ,CH <sub>4</sub> (optional)		
Power KVA	220	650	400	680
Loads Kg	260	2000	1000	1500
Equipment size m <sup>3</sup>	3.8X4.5X2.9	5.9X7.6X3.9	5.9X5.9X3.6	6.4X7.6X4.7

H T

Heat treatment

## High pressure gas quenching vacuum furnace

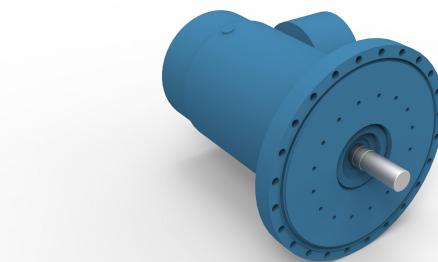
### ■ High performance

- Quenching、annealing、normalizing、brazing、tempering、hardening、low pressure carburizing、low pressure carbonnitriding or high-temp solution nitriding all in one.
- Temp uniformity  $\leq \pm 5^{\circ}\text{C}$ .
- 12 bar gas quenching pressure.
- Cooling from both side with coanda module, fast and uniform cooling .
- Accurate process control with less deformation.



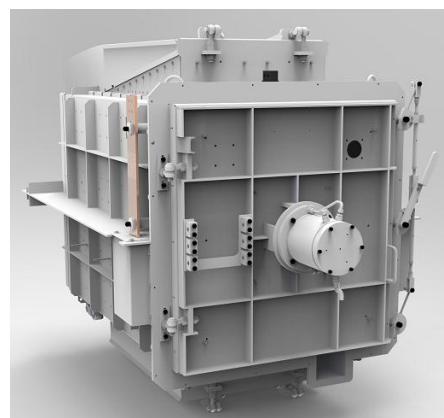
### ■ Energy efficiency

- Water-cooled inverter cooling fan .
- Convection assisted heating, less heating time.
- Better insulation with low energy consumption.



### ■ Easy maintenance

- Modular design , easy to assemble.
- Easy access for the control cabinets.
- Reliability and availability of spare parts according to smart modular design.



## ■ High pressure gas quenching vacuum furnace

	HT45/60/45	HT61/91/61	HT91/120/91
Working zone mm	455 x 600 x 455	610 x 910 x 610	910 x 1220 x 910
Max loads Kg	400	800	1500
Max temp °C		1350	
Operation temp °C		540 to 1320	
Temp uniformity °C		≤±5	
Max quenching pressure bar		12	
Hot zone		Graphite	
Vacuum	low vacuum / high vacuum(optional)		
Power KVA	135	202	343
Gas	Ar,N <sub>2</sub>		
Equipment m <sup>3</sup>	5.25 x 2.5 x 3.9	5.7 x 2.5 x 3.8	6.7 x 3.1 x 4.05

HT

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**Most Competitive Price | Individual Solution**

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