HAOYUE

Comprehensive Solution Provider for

Advanced Sintering & Special Bonding Technologies and Equipment.

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ABOUT US

HAOYUE TECHNOLOGY

Shanghai Haoyue Technology Co., Ltd. is a comprehensive solution provider focusing on technologies and equipment for advanced material sintering and special material bonding. Integrating R&D, production, sales and services, the company holds the qualifications of National High-tech Enterprise and Specialized, Refined, Unique & Innovative Enterprise.

The company owns a modern plant covering 15,000 m² equipped with advanced processing machinery. A rigorous quality management system has been established to ensure the manufacturing precision and quality of products reach advanced industry standards. Our R&D team consists of industry specialists. With more than 70 patents and software copyrights granted, we are capable of delivering diversified, efficient and reliable equipment as well as process solutions for sintering, heat treatment and special material bonding. Our core product portfolio includes vacuum brazing furnaces, vacuum diffusion bonding systems, vacuum annealing furnaces, Spark Plasma Sintering (SPS) equipment, vacuum hot pressing furnaces, gas pressure sintering furnaces, vacuum sintering furnaces, hydrogen furnaces and more. Our key served industries cover seven major sectors: aerospace & gas turbines; semiconductors and electronic information materials; advanced ceramics and superhard materials; cemented carbides, powder metallurgy and refractory metals; new energy, hydrogen energy and nuclear energy; additive manufacturing and high-end casting; high-end bonding, heat exchange and thermal management. We deliver robust technical support and equipment assurance for the manufacturing of advanced materials and reliable forming of critical components.

Backed by strong manufacturing capacity, consistent product quality, as well as the service philosophy of rapid response, professional troubleshooting, full-cycle accountability and sustained value creation, our business footprint spans numerous countries and regions worldwide, establishing us as a competitive supplier of sintering and special material bonding equipment on the global market. Meanwhile, the company operates an equipment exhibition hall of over 500 m² and an advanced material sintering R&D laboratory of 3,000 m². Centered on post-processing for additive manufacturing, advanced ceramic sintering, near-net shaping in powder metallurgy, high-end bonding and thermal management, the platform provides sophisticated scientific research, verification and testing services for internal teams and external partners.

Looking ahead, Haoyue Vacuum adheres to the brand proposition: Making advanced materials easier to manufacture; enabling more reliable critical bonds.Guided by our corporate mission — to help customers realize reliable manufacturing of high-end materials and key components through innovative advanced equipment and processes, we uphold our core values: customer success, technological innovation, quality priority, integrity and accountability, collaborative co-creation and long-term thinking. We promote the enterprise spirit of truth-seeking, innovation, precision craftsmanship and responsibility, and practice our business philosophy of focusing on high-end markets, technology-driven development, customer success, win-win cooperation and sustainable growth. We respect talents, prioritize strivers, and ensure contributors share the fruits of development. We strive to become a world-leading enterprise in advanced sintering and special material bonding technologies and equipment, and continuously drive the advancement of high-end material manufacturing.

Lab-scale Vacuum Furnace Product Selection Table

Product Series	Model	Max. Temp. (°C)	Heater	Ultimate Vacuum (Pa)	Vacuum Pumps	Chamber Size (mm)	Overall Dimensions L×W×H(mm)	Weight (Kg)	Applications	Note
S Series Spark Plasma Sintering (SPS) System	S2	2400°C	SPS	1	Direct-coupled Pump	Φ80×250	1425×1550×1850	1300	Sintering	Servo pressure 10T, accuracy ±1‰, Heating rate 400°C/min, Compressible Φ30-50mm procucts
	S3	2200°C	SPS	1	Direct-coupled Pump	Φ100×250	1423×2153×2050	2100	Sintering	Servo pressure 20T, accuracy ±3‰, Heating rate 400°C/min, Compressible Φ50-80mm procucts
P Series Vacuum Hot Pressing Furnace	P2GR20	2000°C	GR	6.7×10^{-3}	Direct-coupled Pump + Diffusion Pump	200×200×300	1425×1550×1850	1600	Hot Press / Sintering	Servo pressure 30T, accuracy ±3‰, Heating rate 20°C/min, Compressible Φ20-80mm procucts
	P2GR24	2400°C	GR	6.7×10^{-3}	Direct-coupled Pump + Diffusion Pump	200×200×300	1425×1550×1850	1600	Hot Press / Sintering	Servo pressure 30T, accuracy ±3‰, Heating rate 20°C/min, Compressible Φ20-80mm procucts
	P2CO20	2000°C	CO	6.7×10^{-3}	Direct-coupled Pump + Diffusion Pump	Φ200×200	1423×2150×2050	2000	Hot Press / Sintering	Servo pressure 30T, accuracy ±3‰, Heating rate 100°C/min, Compressible Φ20-80mm procucts
	P2CO24	2400°C	CO	6.7×10^{-3}	Direct-coupled Pump + Diffusion Pump	Φ200×200	1423×2150×2050	2000	Hot Press / Sintering	Servo pressure 30T, accuracy ±3‰, Heating rate 100°C/min, Compressible Φ20-80mm procucts
D Series Diffusion Bonding Furnace	D2MO14	1400°C	MO	6.7×10^{-4}	Direct-coupled Pump + Diffusion Pump	200×200×300	1425×1550×1850	1500	Diffusion Bonding / Brazing / Degassing	Servo electric pressure 5T, accuracy ±1‰, Heating rate 10°C/min, Compressible 160×180×160mm procucts
	D2GR20	2000°C	GR	6.7×10^{-3}	Direct-coupled Pump + Diffusion Pump	200×200×300	1425×1550×1850	1500	Diffusion Bonding / Degassing / Sintering	Servo electric pressure 5T, accuracy ±1‰, Heating rate 10°C/min, Compressible 160×180×160mm procucts
V Series Vacuum Furnace	V2GR20	2000°C	GR	6.7×10^{-3}	Direct-coupled Pump + Diffusion Pump	200×200×300	1425×1550×1850	1300	Sintering / Annealing / Degreasing	Graphite furnace, Heating rate 20°C/min
	V2GR24	2400°C	GR	6.7×10^{-3}	Direct-coupled Pump + Diffusion Pump	200×200×300	1425×1550×1850	1300	Sintering / Annealing / Degreasing	Graphite furnace, Heating rate 20°C/min
	V2A10	1000°C	A	6.7×10^{-4}	Direct-coupled Pump + Diffusion Pump	200×200×300	1425×1550×1850	1300	Sintering / Annealing/ Degreasing	Alloy resistance strip furnace, Heating rate 10°C/min
	V2MO13	1300°C	MO	6.7×10^{-4}	Direct-coupled Pump + Diffusion Pump	200×200×300	1425×1550×1850	1300	Annealing / Brazing Degreasing	Molybdenum strip furnace, Heating rate 10°C/min
	V2W20	2000°C	W	6.7×10^{-4}	Direct-coupled Pump + Diffusion Pump	200×200×300	1425×1550×1850	1300	Sintering / Annealing / Degreasing	Tungsten strip furnace, Heating rate 10°C/min
	V2CO20	2000°C	CO	6.7×10^{-3}	Direct-coupled Pump + Diffusion Pump	Φ200×200	1423×2150×2050	1600	Sintering / Annealing	Induction furnace, Heating rate 100°C/min
	V2CO24	2400°C	CO	6.7×10^{-3}	Direct-coupled Pump + Diffusion Pump	Φ200×200	1423×2150×2050	1600	Sintering / Annealing	Induction furnace, Heating rate 100°C/min
H Series Hydrogen Furnace	H2MO14	1400°C	MO	6.7×10^{-4}	Direct-coupled Pump + Diffusion Pump	200×200×300	1425×1550×1850	1300	Reduction / Annealing / Brazing	Hydrogen furnace, Heating rate 10°C/min
	H2W20	2000°C	W	6.7×10^{-4}	Direct-coupled Pump + Diffusion Pump	200×200×300	1425×1550×1850	1300	Reduction / Annealing / Sintering	Hydrogen furnace, Heating rate 10°C/min
G Series Gas Pressure Sintering Furnace	G2VGR20	2000°C	GR	10	Direct-coupled Pump	Φ200×250	2000×1500×1730	3000	Pneumatic Sintering / Partial Pressure / Degreasing	Vertical, 10MPa gas pressure furnace, Heating rate 10°C/min
	G2HGR20	2000°C	GR	6.7×10^{-3}	Direct-coupled Pump + Diffusion Pump	200×200×300	1850×1720×2100	1700	Pneumatic Sintering/ Hot Pressing Sintering/ Vacuum Sintering	Horizontal, 1MPa air pressure, 30T Hydraulic pressure, High vacuum integrated furnace, Heating rate 10°C/min
I Series Hot Isostatic Pressing	I1CC20	2000°C	C/C	10	Direct-coupled Pump	Φ100×150	2000×1500×1730	4300	Hot Isostatic Sintering	Vertical, 200MPa gas pressure furnace, Heating rate 10°C/min
	I1MO14	1400°C	MO	10	Direct-coupled Pump	Φ100×150	2000×1500×1730	4500	Hot Isostatic Sintering	Vertical, 200MPa gas pressure furnace, Heating rate 10°C/min
	I2CC20	2000°C	C/C	10	Direct-coupled Pump	Φ200×250	8000×3700×3500	15000	Hot Isostatic Sintering	Vertical, 200MPa gas pressure furnace, Heating rate 10°C/min
	I2MO14	1400°C	MO	10	Direct-coupled Pump	Φ200×250	8000×3700×3500	15000	Hot Isostatic Sintering	Vertical, 200MPa gas pressure furnace, Heating rate 10°C/min

Optional Configurations (Notes on Available Accessories):

1. AD (Alloy Degreasing Box)
2. GRD (Graphite Rod Furnace Degreasing)
3. H2RFC (Hydrogen 2-way Rotameter Flow Control)
4. H2MFC (Hydrogen 2-way Mass Flow Control)
5. OM (Oil Direct-coupled Pump + Molecular Pump Assembly)
6. DM (Dry Screw Pump + Molecular Pump Assembly)
7. UPS (Uninterruptible Power Supply)
8. AC (Air Conditioner)
9. OCA (Oxygen Content Analyzer)
10. HDP (Hydrogen Dew Point Meter)
11. HGB (Glove Box)
12. HM (Mold)
13. HD (Demolding Unit)
14. HA (Air Compressor)
15. HCA (Chiller Air-cooled)

Spark Plasma Sintering (SPS) System

S Series

- S2 Front View -

Introduction:

The SPS (Spark Plasma Sintering) discharge plasma sintering system is one of the most advanced sintering systems in the world today. It is a new rapid sintering technology that applies pulsed current and axial pressure between two electrodes to achieve powder sintering and densification. The system is characterized by fast heating rates, short sintering times, controllable microstructure, and energy efficiency with environmental benefits. It can be used to prepare metallic materials, ceramic materials, and composite materials, as well as nanocrystalline bulk materials, amorphous bulk materials, and gradient materials. Furthermore, SPS equipment provides the possibility for manufacturing very specialized new materials, such as sintering nanocrystalline materials without significant grain growth, functionally graded materials, composite materials, tungsten carbide, silicon nitride, silicon carbide, or other hard materials, structural ceramics, and functional ceramics.

Applications:

- Pure Metals: Fe, Cu, Al, Au, Ag, Ni, Cr, Mo, Sn, Ti, W, Be
- Ceramic Oxides: Al_2O_3, ZrO_2, MgO, SiO_2, TiO_2, HfO_2
- Carbides: SiC, BeC, WC, ZTC, VC
- Nitrides: Si_3N_4, TaN, TiN, AlN, ZrN, VN
- Borides: TiB_2, HfB_2, LaB_6, ZrB_2, VB_2
- Fluorides: LiF, CaF_2, MgF_2
- Cermets/Metal Ceramics: Si_3N_4+Ni, Al_2O_3+Ni, ZrO_2+Ni, Al_2O_3+Ti, SUS+WC/Co, BN+Fe, WC+Co+Fe
- Intermetallic Compounds: TiAl, $MoSi_2$, Si_3Zr_5, NiAl, NbCo, NbAl, Sm_2Co_{17}

Advantages

- This series of discharge plasma sintering systems fully incorporates automation and controllability of the sintering process. Sintering temperature, pressure control, electrical current control, and other automatic programmed control systems are standard equipment configurations.
- The equipment is equipped with a safety shutdown function. When water temperature abnormalities, mold damage, or other emergency conditions are detected, the equipment automatically shuts down.
- Equipped with a data acquisition and analysis system that can store and retrieve process parameters determining sintered product quality—including sintering voltage, electrical current, control temperature, applied pressure, displacement, vacuum level, displacement change rate, and measured temperature—for production process traceability.
- The equipment employs an independently developed pulsed DC power supply that, compared to conventional equivalent-level SPS systems, significantly reduces power consumption and effectively achieves energy-efficient, low-emission, environmentally friendly high-quality sintering production.
- Uses a front-loading water-cooled vacuum sintering chamber, enabling convenient and simple workpiece loading/unloading, in-chamber operations, maintenance, and repairs.
- Equipped with a large LCD touchscreen control panel for real-time diagnosis and confirmation of displacement data display, interlocked status display, alarm history, and applied pressure settings.
- To prevent misoperation of equipment buttons or controls, the equipment is equipped with safety interlocked functions, ensuring safe operation even for inexperienced operators.

- S3 Isometric View -

Specifications & Parameters:

Model	Sample Dia. (mm)	Pressure (ton)	Voltage (V)	Current (A)	Heating Power (kW)	Ultimate Vacuum (Pa)	Max. Temp. (°C)
S2	Φ30-50	10	10	5000	50	1	2400
S3	Φ50-80	20	10	10000	100	1	2200

Vacuum Hot Pressing Furnace

P Series

- P2 Isometric View -

Introduction:

The vacuum hot-press sintering furnace is a complete equipment system for hot-pressing materials under vacuum (or other atmospheric conditions). It primarily employs resistive or inductive heating, with an oil-cylinder-driven press head providing vertical compression. At elevated temperatures, material undergoes bonding between solid particles, grain growth occurs, and voids (porosity) and grain boundaries progressively decrease. Through material transport and densification, overall volume contracts and density increases, ultimately producing a dense polycrystalline sintered body with specific microstructure, thereby forming and consolidating the material through hot-press sintering.

Applications:

Suitable for high-temperature hot-press sintering, forming, and densification of functional ceramics (alumina, silicon carbide, boron carbide, boron nitride, etc.), cemented carbides (superalloys, metal powders), and advanced materials in powder metallurgy. Also applicable for heat treatment of powder or preforms at temperatures below the melting point of major components. The objective is to enhance material density through hot-press sintering, improving strength, hardness, and wear resistance.

Advantages:

- **Convenient Operation:** Horizontal, integrated, side-opening-door design; high mold precision; easy equipment mobility and operation.
- **Rapid Heating and Cooling:** Inductive heating rate 100°C/min (up to 1600°C); resistive heating rate 20°C/min (up to 1600°C).
- **Excellent Temperature Uniformity:** Average temperature uniformity ±5°C (5-point measurement; maintained at 1000°C for 1 hour).
- **High Pressure Accuracy:** Servo hydraulic control system; pressure accuracy ±3%.
- **Vacuum Bypass:** Prevents direct evacuation through primary channels, which would create excessive flow velocity carrying furnace powder charge, causing material loss and contaminating the vacuum pump system. Also prevents atmospheric crosstalk between chambers via shared lines, avoiding cross-contamination and production quality degradation.
- **Safety Performance:** HMI + PLC + PID pressure sensor control; safe and reliable.
- **Sealing Performance:** Dynamic press head equipped with bellows seal, ensuring no oil-gas leakage.

- P2CO Front View -

Specifications & Parameters:

Model	Die Dimensions (mm)	Sample Dia. (mm)	Mechanical Pressure (ton)	Ram Stroke (mm)	Heating Power (kW)	Ultimate Vacuum (Pa)	Max. Temp. (°C)	Applications
P2GR20	Φ160×160	Φ80	30	100	45	6.7×10^{-3}	2000	Hot Pressing / Sintering
P2GR24	Φ160×160	Φ80	30	100	50	6.7×10^{-3}	2400	Hot Pressing / Sintering
P2GR20 Plus	Φ210×160	Φ120	50	100	45	6.7×10^{-3}	2000	Hot Pressing / Sintering
P2CO20	Φ160×160	Φ80	30	100	45	6.7×10^{-3}	2000	Hot Pressing / Sintering
P2CO24	Φ160×160	Φ80	30	100	50	6.7×10^{-3}	2400	Hot Pressing / Sintering
P2CO20 Plus	Φ210×160	Φ120	50	100	45	6.7×10^{-3}	2000	Hot Pressing / Sintering

Vacuum Diffusion Bonding Furnace

D Series

Introduction

Diffusion bonding is a solid-state joining process in which workpieces are pressurized at elevated temperature without producing visible deformation or relative displacement. Diffusion welding is particularly suited for joining dissimilar metals, heat-resistant alloys, ceramics, intermetallic compounds, and composite materials—especially where conventional fusion bonding is limited. Its distinct advantages are increasingly recognized.

- D2 Isometric View -

Applications:

Diffusion bonding is especially suitable for small components requiring vacuum sealing, joints of equal strength to the base material, and zero deformation. It is employed for bonding metals to non-metals in vacuum equipment, and for joining cemented carbide, ceramics, and high-speed steel to carbon steel in cutting tools. It is also particularly well-suited for dissimilar metals, non-metallic materials such as graphite and ceramics, dispersion-strengthened superalloys, metal-matrix composites, and porous sintered materials.

Advantages:

- Diffusion bonding does not overheat or melt the substrate, allowing reliable bonding of virtually all metals and non-metals while preserving material properties. It is especially suitable for materials difficult to join by fusion bonding and other methods, such as active metals, heat-resistant alloys, ceramics, and composite materials. For materials with poor plasticity or high melting points, and for dissimilar materials that are immiscible or produce brittle intermetallic compounds during fusion bonding, diffusion bonding is the preferred joining method.
- Joint quality is excellent. The microstructure and properties of the weld are close to or identical to the base material. The weld is free from fusion bonding defects and thermal effects such as grain overgrowth and heat-affected zones. Bonding parameters are easily controlled with precision, and batch production achieves consistent joint quality and properties.
- Workpieces exhibit high precision with minimal deformation. Because bonding pressure is low and workpieces are heated uniformly with furnace cooling, overall plastic deformation is minimal. Post-weld machining is typically unnecessary.
- Large cross-section workpieces can be joined. Since the required welding pressure is modest, equipment tonnage for large-section welding is modest and readily achievable.
- Complex structures, inaccessible joints, and workpieces with large thickness variations can be welded. Multiple joints in assembled components can be welded simultaneously.

- D2 Front View -

Specifications & Parameters:

Model	Chamber Size (mm)	Heater	Ultimate Vacuum (Pa)	Mechanical Pressure (ton)	Max. Temp. (°C)	Applications
D2MO14	200×200×300	MO	6.7×10^{-4}	5	1400	Diffusion Bonding / Brazing / Degassing
D2GR20	200×200×300	GR	6.7×10^{-3}	5	2000	Diffusion Bonding / Degassing / Sintering

Vacuum Furnace

V Series

- V2 Isometric View -

Introduction:

This vacuum furnace employs graphite, alloy resistance strip, molybdenum strip, tungsten strip, induction heating, or other heating elements as resistance heating elements. Its primary applications include sintering, annealing, brazing, degreasing, and degassing of ceramics, tungsten carbide, composite materials, stainless steel, and other materials under vacuum or protective atmospheres. It can also be used for high-temperature heat treatment of metal materials under high-vacuum conditions or for degassing treatment of precious metal materials.

Applications:

Applicable to sintering of semiconductor materials such as silicon, SiC ceramics, and others to obtain high-purity, high-performance materials; manufacturing various ceramic products including structural ceramics and functional ceramics; hot-press dies; high-temperature heating elements/fasteners; hot zone materials; graphite products; graphene; carbon nanotubes, and more. Suitable for numerous processes and can assist scientific research institutions in the development of new materials.

- V2 Front View -

Advantages:

- **User-Friendly Operation:** Horizontal, integrated design with side-opening door structure; high precision in loading and unloading fixtures; equipment is portable and easy to operate.
- **Fast Heating / Cooling Rates:** Induction heating rate of 100°C/minute (up to 1600°C); resistance heating rate of 20°C/minute (up to 1600°C).
- **Excellent Temperature Uniformity:** Average temperature uniformity of ±5°C (measured at 5 points; maintained at 1000°C for 1 hour in isothermal zone).
- **Vacuum Bypass:** Prevents rapid gas flow during open-channel evacuation, which would carry away powder from inside the furnace, causing material loss and contaminating the vacuum pump system. Also prevents cross-contamination between furnace chambers when using shared piping, protecting product purity.
- **Safety Performance:** Employs HMI + PLC + PID program temperature control for safe and reliable operation.
- **Strong Extensibility:** Capable of sintering, brazing, annealing, degreasing, degassing, and reduction processes.

Specifications & Parameters:

Model	Heater	Chamber Size (mm)	Heating Power (kW)	Ultimate Vacuum (Pa)	Max. Temp. (°C)
V2GR20	GR	200×200×300	45	6.7×10^{-3}	2000
V2GR24	GR	200×200×300	50	6.7×10^{-3}	2400
V2A10	A	200×200×300	30	6.7×10^{-4}	1000
V2MO13	MO	200×200×300	40	6.7×10^{-4}	1300
V2W20	W	200×200×300	45	6.7×10^{-4}	2000
V2CO20	CO	Φ200×200	45	6.7×10^{-3}	2000
V2CO24	CO	Φ200×200	50	6.7×10^{-3}	2400

Vacuum Hydrogen Furnace

H Series

- H2 Isometric View -

Introduction:

The vacuum hydrogen furnace is a vacuum resistance furnace using molybdenum strip / tungsten mesh as the heating element, primarily for high-temperature sintering of ceramics, cemented carbides, and composite materials in vacuum or protective atmosphere conditions. It can also be used for high-temperature heat treatment of metal materials under high vacuum or degassing treatment of precious metal materials. The equipment features advanced and rational structural design, with design and manufacturing complying with relevant national and industry standards and specifications, meeting user operational requirements. Its supporting products and components have achieved international advanced levels, capable of meeting long-term, stable, safe, and reliable production demands. The equipment offers excellent energy-saving performance. Operation, control, and maintenance are convenient and efficient, with attractive appearance, safety, reliability, and superior after-sales service.

Applications:

Equipment for ceramic sintering, metallization, needle soldering, glass component sealing, metal component annealing and purification, and related processes. Primarily used for heat treatment of tool steel, die steel, high-speed steel, ultra-high-strength steel, magnetic materials, stainless steel, and non-ferrous metals in hydrogen atmosphere.

Advantages:

- The furnace body adopts a horizontal structure with a unique crucible design ensuring uniform gas flow distribution and uniform service life. The outer shell uses double-layer SUS304 stainless steel material.
- The heating element uses molybdenum strip with excellent mechanical properties at high temperature, with surface load determined within a reasonable range. The horizontal structure ensures rapid heat transfer, and component maintenance and replacement are simple and quick.
- **Fast heating:** Heating rate 1~15°C/min (at temperatures<1400°C); 1~10°C/min (at temperatures >1400°C).
- **Well-optimized design:** The heating chamber hot zone is calculated through thermal simulation, featuring very high temperature uniformity. The configured heating elements and insulation layers use modular optimized design.
- Low investment cost, low operating cost, simple installation, convenient operation and maintenance, high safety performance, and excellent control characteristics.
- **High safety:** Features overpressure and overtemperature fault alarm, mechanical automatic pressure protection, action interlocking, and other functions ensuring high equipment safety.

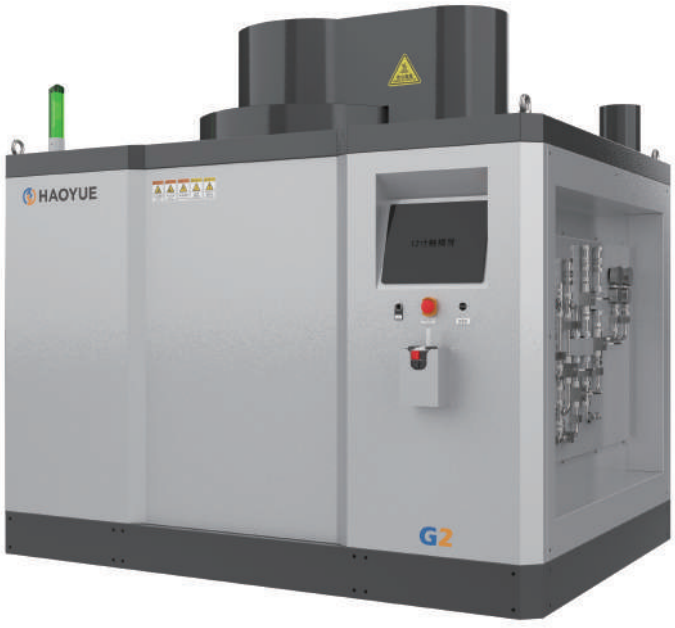
- H2 Front View -

Specifications & Parameters:

Model	Chamber Size (mm)	Heater	Heating Power (kW)	Ultimate Vacuum (Pa)	Max. Temp. (°C)
H2MO14	200×200×300	MO	40	6.7×10^{-4}	1400
H2W20	200×200×300	W	45	6.7×10^{-4}	2000

Gas Pressure Sintering Furnace

G Series



- G2VGR20 Isometric View -

Introduction:

Gas-pressure sintering refers to a process sequence: first performing the sintering process at low pressure, then sintering materials at atmospheric pressure to achieve stable state, followed by sintering at high gas pressure (resulting in further densification of the material and rapid stress relief). After the high-temperature, high-pressure sintering process, all aspects of the material's mechanical properties (hardness, strength, toughness, etc.) are superior to those achieved by conventional sintering processes.

Applications:

Under high-pressure protective atmosphere conditions, structural ceramics (such as silicon carbide, zirconia, alumina, silicon nitride, etc.) and functional ceramics (such as piezoelectric ceramics, magnetic ceramics, etc.), metal materials (such as cemented carbides), and composite materials are sintered under high-pressure nitrogen or argon atmosphere. This method is beneficial for increasing the sintering density of materials and improving mechanical properties. It is also suitable for use by colleges, universities, and scientific research units for experimental work and process confirmation.

- G2HGR20 Isometric View -

HAOYUE Technology 2024 New Product Launch:
G2HGR20 Multifunctional Integrated Furnace

This equipment integrates three major sintering processes—hot-press sintering, gas-pressure sintering, and vacuum sintering—into one multifunctional furnace (one device replaces three separate devices: hot-press furnace, gas-pressure furnace, and vacuum furnace). It achieves three major functions: 30 T mechanical pressure, 1 MPa gas pressure, and vacuum capability (6.7×10^{-3} Pa). This is HAOYUE Technology's 2024 new product, featuring advantages including high safety, multiple functions, compact footprint, high pressure accuracy, fast heating rate, and simple appearance.

Advantages:

Gas-pressure sintering equipment is particularly suitable for sintering ceramics or metals that easily decompose at high temperatures or cannot be sintered through standard sintering processes. Like hot sintering, this process imposes no restrictions on the treatment of sintered components or constraints on geometric shapes, providing a favorable alternative to the more expensive HIP process. Our gas-pressure sintering furnaces can be equipped with an integrated dilatometer that measures shrinkage and shrinkage rate during the sintering cycle. The measurement data obtained is used for process control.

At 2000°C and 10 MPa (in N_2 or Ar), working volumes from 1 liter to 500 liters can be achieved.

Gas-pressure sintering furnaces are used for producing the following materials or components:

- Sintered silicon nitride and sialon (silicon aluminum oxynitride) with good mechanical properties (such as cutting tools, turbocharger engines, engine components).
- Silicon carbide ceramics (high mechanical stress components under corrosive conditions, etc.).
- Superalloys (mechanical stress components for high-temperature applications).
- Hard metals (cemented carbides) with special sintering and lower cobalt content, with optimal mechanical properties and high-quality composite materials, mainly applied in the automotive industry for mass production of SSN components.

Specifications & Parameters:

Model	Heater	Structure	Loading Type	Chamber Size (mm)	Max. Temp. (°C)	Pressure (MPa)	Ultimate Vacuum (Pa)	Heating Power (kW)
G2VGR20	GR	Vertical	Top Loading	Φ200×250	2000	10MPa Gas Pressure	10	50
G2HGR20	GR	Horizontal	Side Loading	200×200×300	2000	30T Hydraulic Pressure 1Mpa Gas Pressure	6.7×10^{-3}	50

Hot Isostatic Pressing Series

I Series

- I1CC20 Front View -

Introduction:

Hot Isostatic Pressing (HIP) is a specialized heat treatment process for metal or ceramic materials, and is an important means of preparing high-performance materials. This process technology can be used for powder metallurgy forming, or for densification treatment of castings (titanium alloys, superalloys, aluminum alloys, and other castings with porosity and shrinkage cavities) after forming. Using inert gas as the pressure transmission medium, equal pressure is uniformly applied from all directions to the component, achieving internal uniformity and density without ultrasonic defects detected.

- I1CC20 Isometric View -

Advantages:

Versatile Applications: Hot Isostatic Pressing for powder metallurgy, densification treatment, and diffusion bonding.

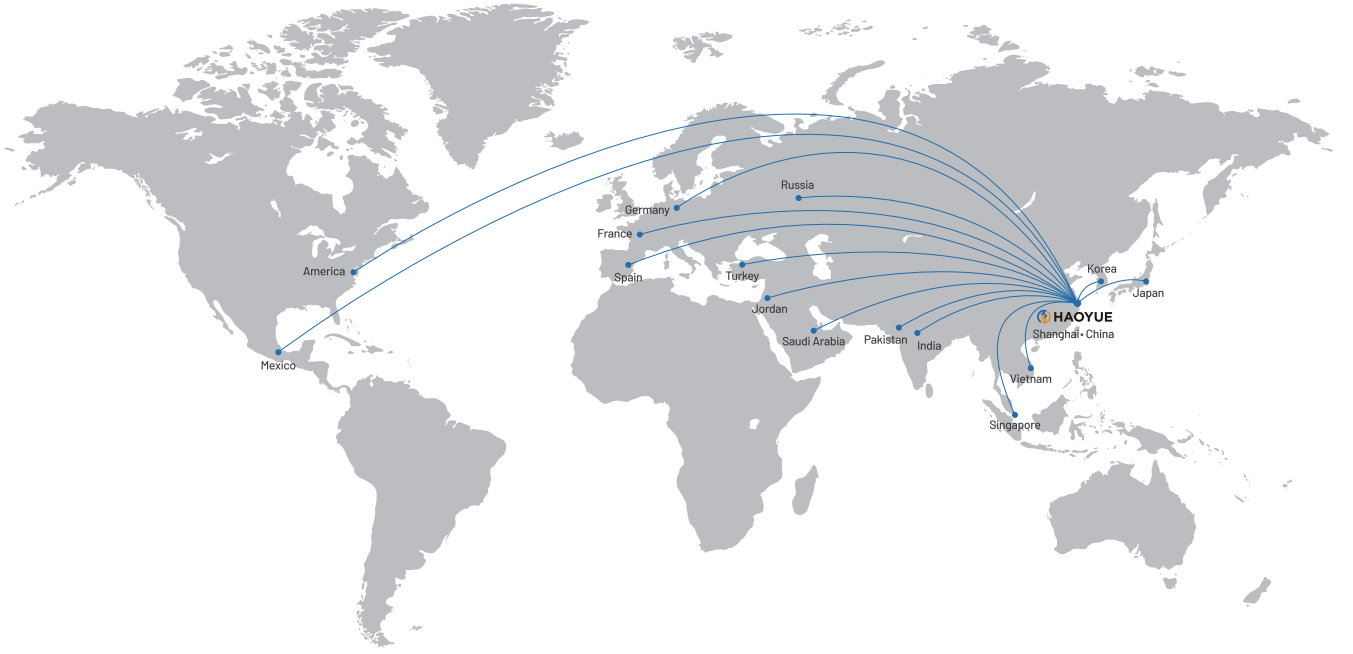
- Hot Isostatic Pressing for Powder Metallurgy:
  - **Flexible Design:** Components designed to approximate the final product shape, reducing raw material waste, machining procedures, and transportation time.
  - **Fine and Uniform Grain Structure:** Exhibits isotropic material properties—excellent wear and corrosion resistance, superior mechanical properties, and extended service life.
  - **Internal Uniformity and Density:** No defects detected by ultrasonic inspection.
  - **No Liquid Phase Formation:** Minimizes segregation, maximizes corrosion resistance.
  - **Bimetallic Preparation:** Enables preparation of ingot stock from two different metals; bimetallic materials can undergo subsequent forging and extrusion processing.
- Densification Treatment:
  - **Elimination of Internal Defects:** Removes shrinkage porosity, shrinkage cavities, and segregation.
  - **Dramatically Extended Fatigue Life:** 10–100 times improvement. Enhanced Ductility and Fracture Toughness.
  - **Theoretical Density Achievement:** Products can attain theoretical density.
  - **Superior Wear and Corrosion Resistance:** Greatly improved performance.
  - **Internal Stress Elimination:** Removes residual stresses within the material.
- Diffusion Bonding:
  - **Complex Geometry Bonding:** Bonds parts with complex contact surfaces while achieving strict dimensional control.
  - **Multi-Material Joining:** Bonds multiple similar or dissimilar materials in a single operation.
  - **Rapid Large-Area Joining:** Enables fast bonding of large surface areas.
  - **Brittle and High-Melting-Point Materials:** Enables solid-state bonding of brittle metals or metals with significantly different melting points that cannot be bonded by conventional welding.
  - **Reduced Edge Defects:** High uniform isostatic pressure reduces or eliminates small porosity and cracks on the outer edges of bonded areas.
  - **Superior Quality:** Eliminates defects typical of traditional welding processes—weld spatter, heat-affected zone, surface porosity, inclusions, undercut, and cracks.
  - After hot isostatic pressing treatment, materials exhibit dramatically improved wear resistance, corrosion resistance, and mechanical properties. Fatigue life can increase10–100 times. The process eliminates internal product defects inherent to conventional manufacturing, such as porosity, internal cracks, and local segregation, thereby improving overall component mechanical performance—especially fatigue performance—while reducing costs and improving energy efficiency.

Applications:

Superalloys, titanium alloys, aluminum alloys, copper alloys, refractory metals, hard alloys, stainless steel, corrosion-resistant alloys, ceramics, composite materials, electronic materials, functional materials, and others.

Specifications & Parameters:

Model	Heater	Structure	Loading Type	Chamber Size (mm)	Max. Temp. (°C)	Gas Pressure (MPa)	Ultimate Vacuum (Pa)	Applications
I1CC20	C/C	Vertical	Top Loading	Φ100x150mm	2000	200	10	Hot Isostatic Sintering
I1MO14	MO	Vertical	Top Loading	Φ100x150mm	1400	200	10	Hot Isostatic Sintering
I2CC20	C/C	Vertical	Top Loading	Φ200x250mm	2000	200	10	Hot Isostatic Sintering
I2MO14	MO	Vertical	Top Loading	Φ200x250mm	1400	200	10	Hot Isostatic Sintering



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