HAOYUE

Comprehensive Solution Provider for

Advanced Sintering & Special Bonding Technologies and Equipment.

www.haoyue-group.com

HY-2026-EⅢ

COMPANY FROFILE

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.

C O N T E N T S

Spark Plasma Sintering (SPS) System

S Series

Fast Heating Rate / Short Sintering Time /
Controllable Organizational Structure /
Energy-saving and Environmental Protection

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. It possesses distinct characteristics including fast heating rate, short sintering time, controllable organizational structure, and energy conservation with environmental protection. The system can be used to prepare metal materials, ceramic materials, and composite materials, as well as nano bulk materials, amorphous bulk materials, and gradient materials.

S-400 Isometric View

Advantages:

Due to the discharge effect caused by the application of DC pulse current during the spark plasma sintering (SPS) process, there are several unique characteristics:

- It can quickly heat up and cool down, significantly shortening production time and reducing production costs (with a heating rate of up to 300°C/min).
- Lower sintering temperature (compared to hot pressing sintering, the sintering temperature can be further reduced).
- Unique purification and activation effect (eliminating the adsorption of gas on the surface of powder particles and breaking through the oxide film), easily achieving the sintering of difficult-to-sinter materials and multi-element materials.
- Compared to traditional sintering processes, materials with more uniform microstructure, greater density, and smaller grain sizes can be obtained in a shorter time.
- Compared to traditional sintering processes, it can significantly save electrical energy.
- Adopting our professional DC pulse power supply technology, featuring fast sintering speed, stable and reliable performance, and excellent energy-saving effect.
- **High Pressure Accuracy:**
  Adopting a servo pressure control system, with pressure accuracy of ±3‰.
- Using dual temperature sensors for temperature measurement—K-type thermocouple for temperature control in the low-temperature range and infrared temperature control in the high-temperature range.
- **Excellent Safety Performance:**
  Adopting industrial control computer + PLC + PID pressure sensing control, safe and reliable.
- **Superior Sealing Performance:**
  Dynamic pressure heads sealed with corrugated pipe to ensure no air leakage.

Applications:

- Metals: Fe, Cu, Al, Au, Ag, Ni, Cr, Mo, Sn, Ti, W, Be.
- Ceramic Oxides: Al_2O_3, Mulitex ZrO_2, Mg, SiO_2, TiO_2, HfO_2.
- Carbides: SiC, B_4C, TaC, WC, ZrC, VC.
- Nitrides: Si_3N_4, TaN, TiN, AlN, ZrN, VN.
- Boride: TiB_2, HfB_2, LaB_6, ZrB_2, VB_2.
- Fluorides: LiF, CaF_2, MgF_2.
- 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.
- Metal Compounds: TiAl, $MoSi_2$, Si_3Zr_5, NiAl, NbCo, NbAl, Sm_2Co_{17}.

S4 Isometric View

Specifications & Parameters:

Model	Sample Dia. (mm)	Pressure (ton)	Voltage (V)	Current (A)	Heating Power (kW)	Ultimate Vacuum (Pa)	Max. Temp. (°C)
S4	Φ80-120	50	10	20000	200	1	2200
S-150	Φ100-150	100	10	30000	300	1	2200
S-200	Φ150-200	200	10	50000	400	1	2200
S-300	Φ200-300	300	10	60000	600	1	2200
S-400	Φ300-400	400	10	80000	800	1	2200

Hybrid Spark Plasma Sintering (SPS + Induction) System

S Series

Good Temperature Uniformity / Fast Heating Rate /
Short Sintering Time /
Controllable Organizational Structure /
Energy-saving and Environmental Protection

S-400D Isometric View

Introduction:

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 densification. The system incorporates induction heating as supplementary heating and features excellent temperature uniformity, rapid heating rate, short sintering time, controllable microstructure, and notable energy conservation and environmental protection characteristics. It can be used to prepare metal materials, ceramic materials, composite materials, as well as nano bulk materials, amorphous bulk materials, gradient materials, and more.

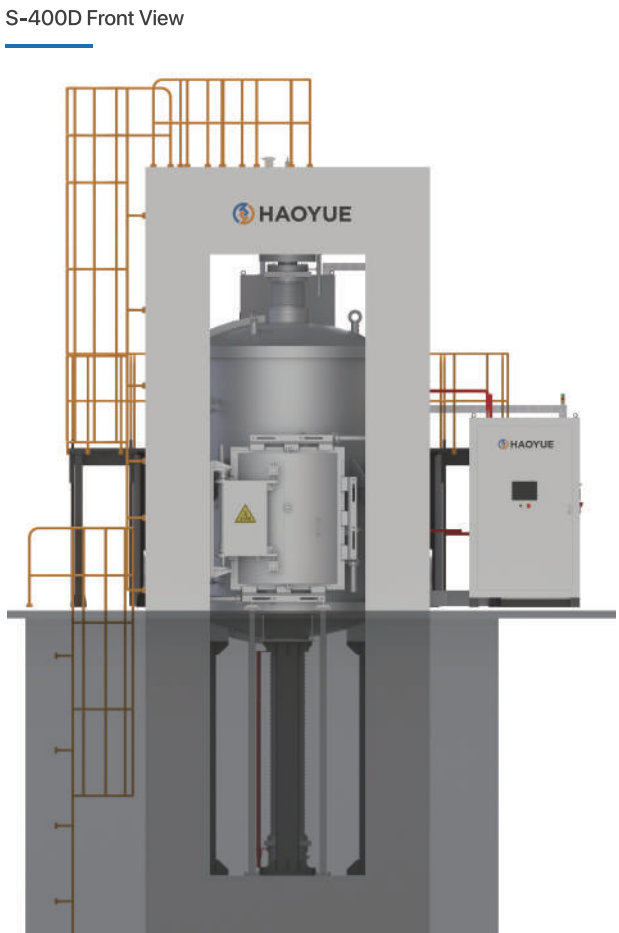
Applications:

- Metals: Fe, Cu, Al, Au, Ag, Ni, Cr, Mo, Sn, Ti, W, Be.
- Ceramic Oxides: Al_2O_3, Mulitex ZrO_2, Mg, SiO_2, TiO_2, HfO_2.
- Carbides: SiC, B_4C, TaC, WC, ZrC, VC.
- Nitrides: Si_3N_4, TaN, TiN, AlN, ZrN, VN.
- Boride: TiB_2, HfB_2, LaB_6, ZrB_2, VB_2.
- Fluorides: LiF, CaF_2, MgF_2.
- 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.
- Metal Compounds: TiAl, $MoSi_2$, Si_3Zr_5, NiAl, NbCo, NbAl, Sm_2Co_{17}.

Advantages:

- Compared to pure SPS sintering, the addition of induction heating thermal field results in more uniform thermal field temperature and reduced temperature difference between the center and edge of material, enabling sintering of larger sized products.
- Large-scale production SPS systems with full consideration for automation and controllability of the sintering process; automatic program control systems for sintering temperature, pressure control, and current control are standard equipment configuration.
- Equipped with data collection and analysis system capable of recording and retrieving physical process parameters that determine sintered product quality, including sintering voltage, current, control temperature, applied pressure, displacement, vacuum degree, displacement change rate, and measured temperature for tracking product production processes.
- Equipment employs self-developed pulsed DC power supply which significantly reduces power consumption compared to traditional equivalent-level SPS systems, truly and effectively achieving energy-saving, consumption-reducing, and environmentally friendly high-grade sintering production.

S-400D Front View



Specifications & Parameters:

Model	Chamber Size (mm)	Sample Dia. (mm)	Mechanical Pressure (ton)	Ultimate Vacuum (Pa)	Max. Temp. (°C)
S-200D	Φ350×600	Φ200	200	5	2200
S-300D	Φ400×800	Φ300	300	5	2200
S-400D	Φ600×800	Φ400	400	5	2200

Semi-continuous Spark Plasma Sintering (SPS) system

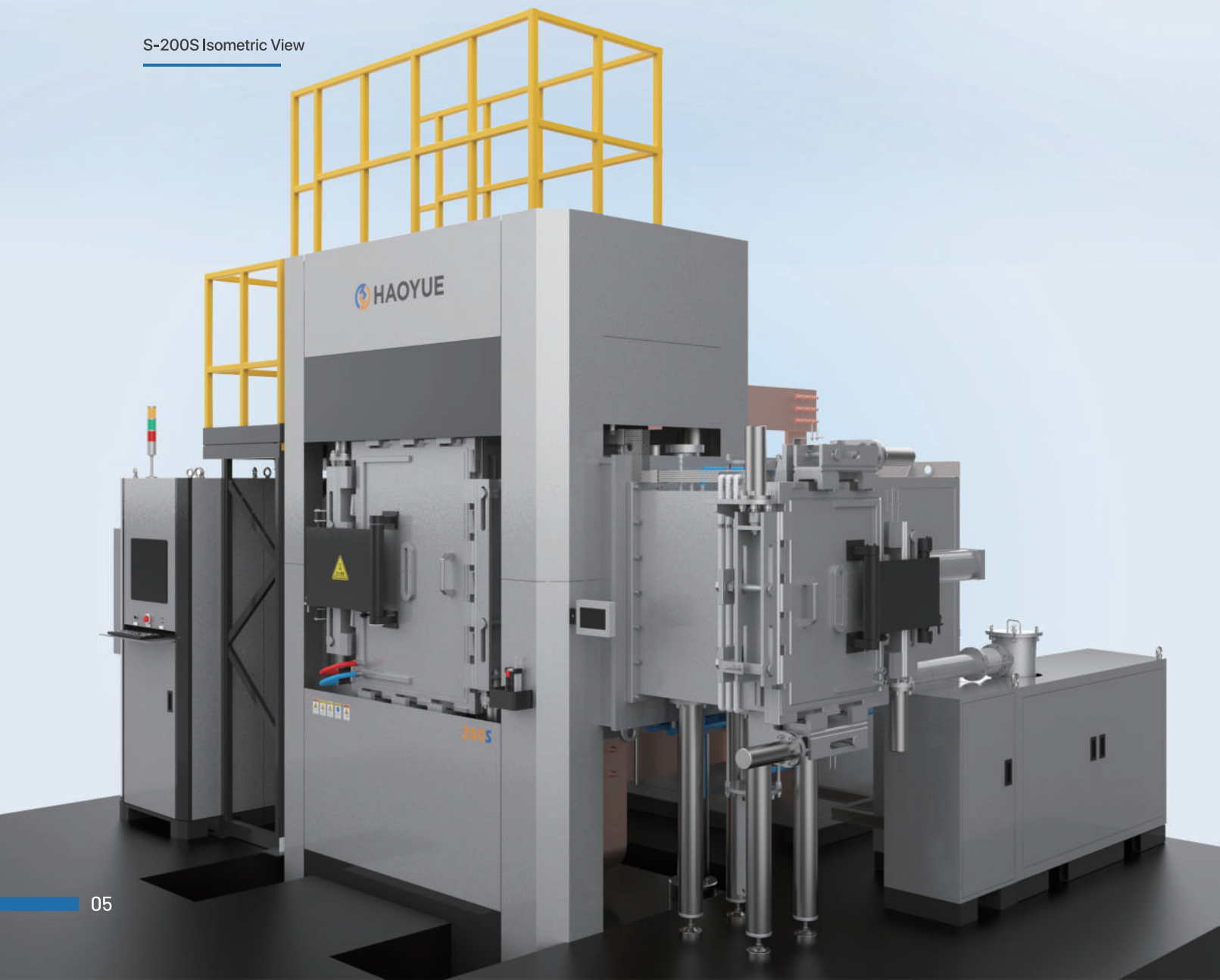
S Series

Good Temperature Uniformity / Fast Heating Rate /
Short Sintering Time / High Production Efficiency /
Controllable Organizational Structure /
Energy-saving and Environmental Protection

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. It possesses distinct characteristics including fast heating rate, short sintering time, controllable organizational structure, and energy conservation with environmental protection. The system can be used to prepare metal materials, ceramic materials, and composite materials, as well as nano bulk materials, amorphous bulk materials, and gradient materials.

S-200S Isometric View



Advantages:

Due to the discharge effects produced by DC pulse current application during the SPS (spark plasma sintering) process, the following distinctive characteristics are present:

- **Semi-continuous Design:**
  Configured with two chambers—one for heating and one for cooling. Compared to continuous SPS systems, this reduces equipment costs while increasing efficiency and production output.
- **Rapid Heating and Cooling:**
  Significantly shortens production time and reduces production costs. Heating rate reaches up to 300°C/min.
- **Unique Purification and Activation Effects:**
  Eliminates gas adsorption on powder particle surfaces and breaks through oxide films, enabling easy sintering of difficult-to-sinter and multi-element materials.
- **Superior Microstructure:**
  Compared to conventional sintering processes, materials achieve more uniform grain structure, greater density, and finer grain size in shorter processing times.
- **Significant Energy Savings:**
  Substantially reduces electrical energy consumption versus traditional sintering methods.
- **Professional DC Pulse Power Supply Technology:**
  Delivers fast sintering speed, stable and reliable performance, and excellent energy efficiency.
- **High Pressure Accuracy:**
  Employs servo pressure control system with pressure accuracy of ±3‰.
- **Dual Infrared Temperature Measurement:**
  One infrared sensor for temperature control; the second for temperature measurement and calibration verification.
- **Excellent Safety Performance:**
  Utilizes industrial PC + PLC + PID pressure sensor control for safe and reliable operation.
- **Superior Sealing Performance:**
  Dynamic pressure heads sealed with corrugated bellows ensure zero gas leakage.

Applications:

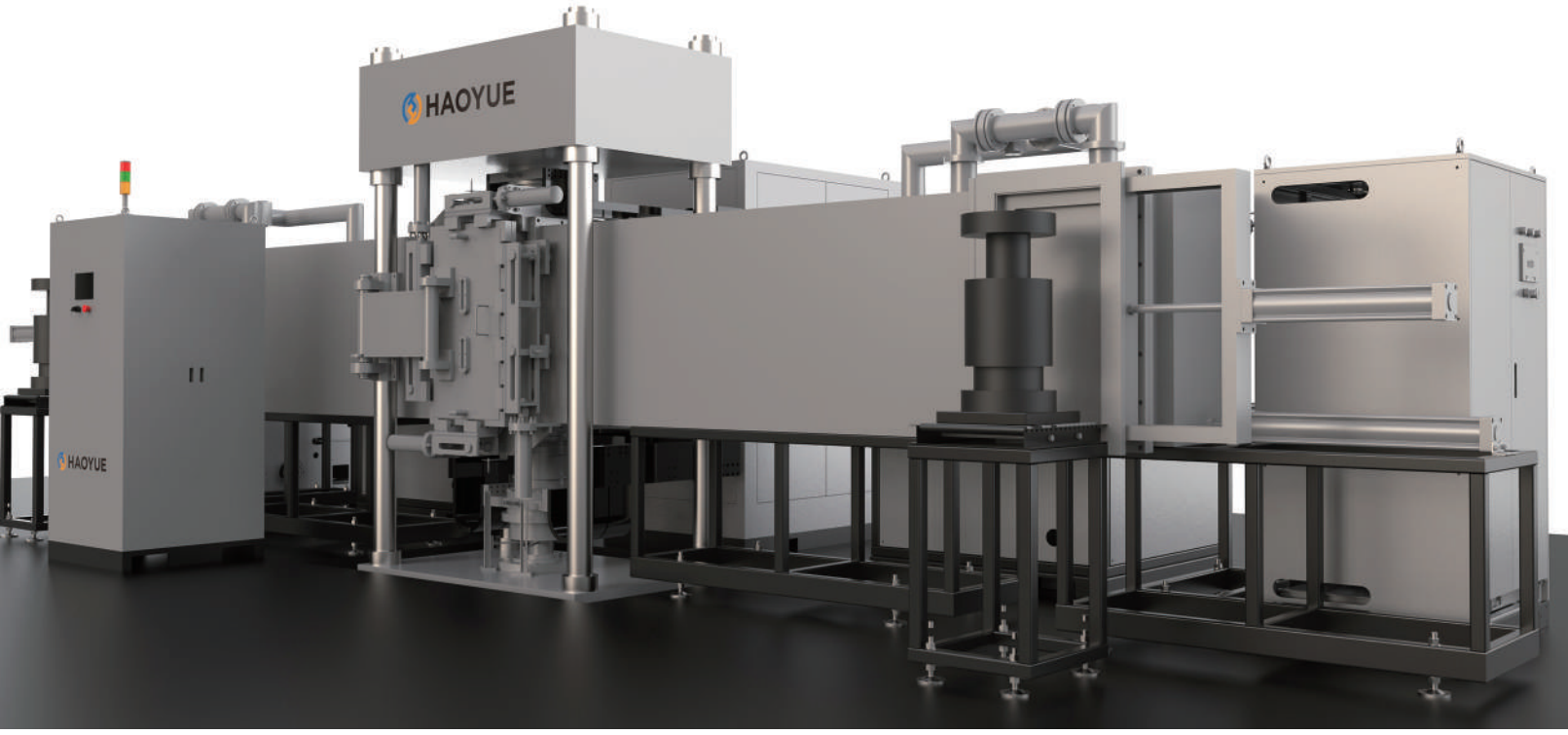
- Metals: Fe, Cu, Al, Au, Ag, Ni, Cr, Mo, Sn, Ti, W, Be.
- Ceramic Oxides: Al_2O_3, Mulitex ZrO_2, Mg, SiO_2, TiO_2, HfO_2.
- Carbides: SiC, B_4C, TaC, WC, ZrC, VC.
- Nitrides: Si_3N_4, TaN, TiN, AlN, ZrN, VN.
- Boride: TiB_2, HfB_2, LaB_6, ZrB_2, VB_2.
- Fluorides: LiF, CaF_2, MgF_2.
- Metal Ceramics: Si_3N_4+Ni, Al_2O_3+Ni, ZrO_2+Ni, Al_2O_3+Ti, SUS+WC/Co, BN+Fe, WC+Co+Fe.
- Metal Compounds: TiAl, $MoSi_2$, Si_3Zr_5, NiAl, NbCo, NbAl, Sm_2Co_{17}.

S-200S Isometric View

Specifications & Parameters:

Model	Structure	Sample Dia. (mm)	Mechanical Pressure (ton)	Ultimate Vacuum (Pa)	Max. Temp. (°C)
S-150S	Semi-continuous (Two chambers)	Φ150	100	10	2200
S-200S	Semi-continuous (Two chambers)	Φ200	200	10	2200

S-150C Isometric View



Continuous Spark Plasma Sintering (SPS) System

S Series

High Production Efficiency / High Automation Level /
Good Temperature Uniformity / Fast Heating Rate /
High Pressure Accuracy / Excellent Safety Performance

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 for powder sintering densification. It has distinctive characteristics such as fast heating rate, short sintering time, controllable microstructure, energy conservation, and environmental protection. It can be used to prepare metal materials, ceramic materials, composite materials, as well as nano bulk materials, amorphous bulk materials, gradient materials, and similar advanced engineered materials.

Advantages:

Due to the discharge effect caused by the application of DC pulse current during the SPS process, the following unique characteristics are observed:

- **Multi-station Design:** Continuous production capability, resulting in significantly increased efficiency.
- **Rapid Heating and Cooling:** Quick temperature rise and cool-down enable dramatically shortened production times and reduced production costs (heating rate up to 200°C/min).
- **Superior Material Properties:** Compared to traditional sintering processes, materials with more uniform microstructure, greater density, and smaller grain sizes are obtained in significantly shorter processing times.
- **No Powder Preforming Required:** Powder can be directly sintered to full density without prior compaction.
- **Professional DC Pulse Power Supply Technology:** Provides fast sintering speed, stable and reliable operation, and excellent energy-saving performance.
- **High Pressure Accuracy:** Servo pressure control system delivers pressure accuracy of ±3‰;
- **High Degree of Automation:** Optional automatic loading and unloading system enables fully automated operation of all processes with digital and intelligent control, requiring no manual intervention.
- **Excellent Safety Performance:** Equipped with IPC+PLC+PID pressure sensor control for safe and reliable operation.
- **Superior Sealing Performance:** Dynamic pressure heads employ corrugated pipe seals to ensure completely leak-free operation.

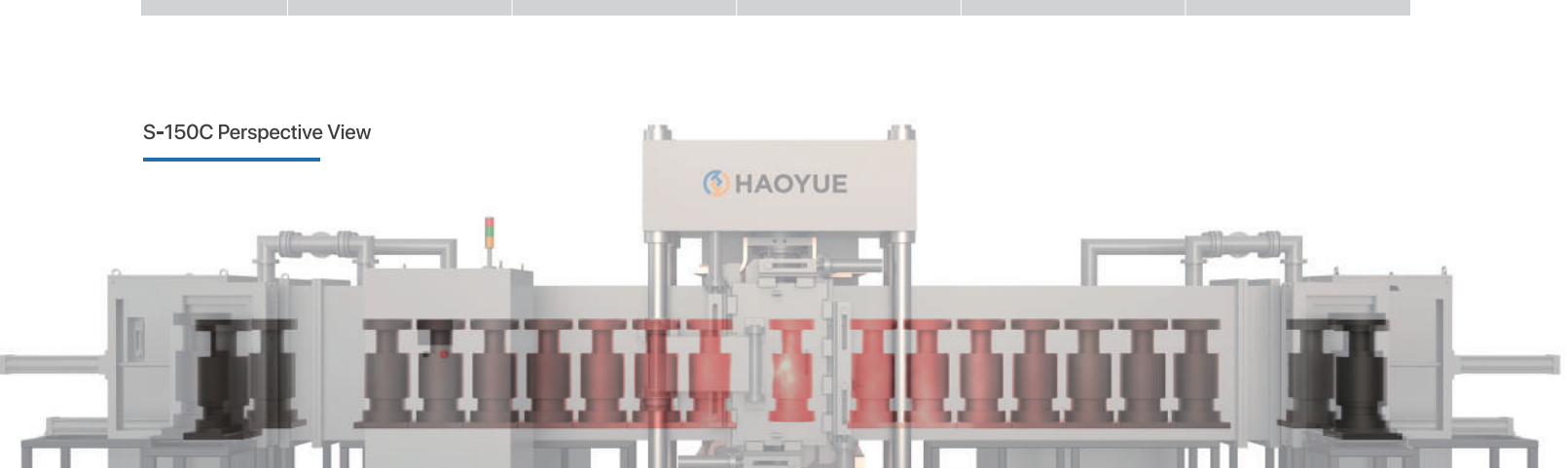
Applications:

- Metals: Fe, Cu, Al, Au, Ag, Ni, Cr, Mo, Sn, Ti, W, Be.
- Ceramic Oxides: Al_2O_3, Mulitex ZrO_2, Mg, SiO_2, TiO_2, HfO_2.
- Carbides: SiC, B_4C, TaC, WC, ZrC, VC.
- Nitrides: Si_3N_4, TaN, TiN, AlN, ZrN, VN.
- Boride: TiB_2, HfB_2, LaB_6, ZrB_2, VB_2.
- Fluorides: LiF, CaF_2, MgF_2.
- 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.
- Metal Compounds: TiAl, $MoSi_2$, Si_3Zr_5, NiAl, NbCo, NbAl, Sm_2Co_{17}.

Specifications & Parameters:

Model	Structure	Sample Dia. (mm)	Mechanical Pressure (ton)	Ultimate Vacuum (Pa)	Max. Temp. (°C)
S-150C	Continuous	Φ150	100	10	2200
S-200C	Continuous	Φ200	200	10	2200

S-150C Perspective View



Vacuum Hot Pressing Sintering Furnace

P Series

Good Design Optimization / Good Temperature Uniformity /
Fast Heating Rate / High Pressure Accuracy /
Excellent Safety Performance

Introduction:

The vacuum hot pressing sintering furnace is a complete set of equipment for forming materials by hot pressing under vacuum or other atmospheric conditions. It primarily uses graphite resistance heating with pressurization applied up and down by an oil cylinder-driven piston. At high temperatures, the solid particles of raw material undergo mutual bonding, grain growth occurs, and voids (pores) and grain boundaries gradually decrease. Through matter transfer, the total volume shrinks and density increases, eventually forming a dense polycrystalline sintered body with a defined microstructure, thereby compressing the material into final shape.

P7VGR22 Isometric View

Advantages:

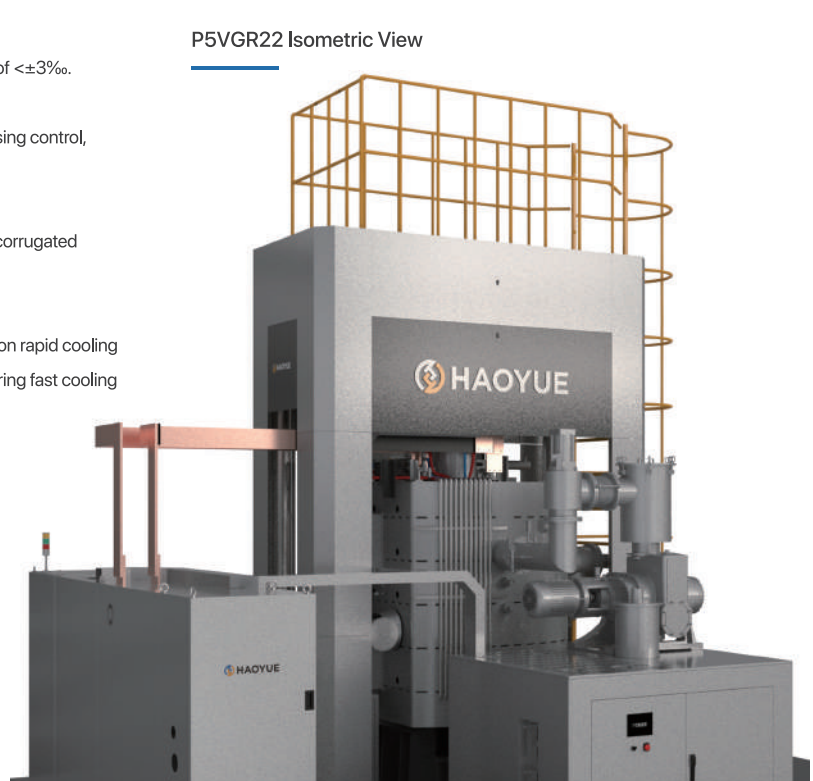
- **Vertical, Side-opening Structure:**
  High precision in mold loading and unloading, easy to operate.
- **Good Design Optimization:**
  The hot zone of the heating chamber has been simulated and calculated in thermal state, with very high temperature uniformity. The configured heating elements and insulation layer are designed with modular optimization.
- **Fast Heating Rate:**
  1~10°C/minute (below 1600°C), 1~5°C/minute (above 1600°C).
- **Good Temperature Uniformity:**
  Average temperature uniformity is ±5°C (measured at 5points, constant temperature zone at 1000°C after 2-hour holding).
- **High Pressure Accuracy:**
  Using a servo hydraulic control system with pressure accuracy of <±3‰.
- **Excellent Safety Performance:**
  Adopting industrial control computer + PLC + PID pressure sensing control, safe and reliable.
- **Superior Sealing Performance:**
  Both upper and lower dynamic pressure heads are sealed with corrugated bellows seals to ensure no air leakage.
- **Fast Cooling Rate:**
  Equipment can be optionally equipped with an external circulation rapid cooling system capable of rapid cooling under 2 bar gas pressure, ensuring fast cooling after hot pressing to enable more efficient operation.

Applications:

Vacuum hot-press sintering furnaces are widely used for net-shape forming and densification treatment of components made from various composite materials, high thermal conductivity materials, niobium oxide, silicon carbide, boron carbide, boron nitride, ceramic materials, copper-based powder materials, iron-based powder materials, iron-copper-based powder materials, and other advanced materials.

For example: aircraft landing brake discs made from iron-copper-based powder materials, bulletproof vests, armored vehicle protective plates, helicopter bulletproof armor, and similar applications.

P5VGR22 Isometric View



Specifications & Parameters:

Model	Structure	Chamber Size (mm)	Sample Dia. (mm)	Mechanical Pressure (ton)	Ultimate Vacuum (Pa)	Max. Temp. (°C)	Applications
P3VGR22	Vertical	Φ300×400	Φ160	100	6.7×10^{-3}	2200	Hot Pressing / Sintering
P5VGR22	Vertical	Φ500×700	Φ300	300	$1/6.7\times10^{-3}$	2200	Hot Pressing / Sintering
P7VGR22	Vertical	Φ700×900	Φ400	600	$1/6.7\times10^{-3}$	2200	Hot Pressing / Sintering
P9VGR22	Vertical	Φ900×900	Φ500	800	$1/6.7\times10^{-3}$	2200	Hot Pressing / Sintering
P11VGR22	Vertical	Φ1100×900	Φ600	1200	$1/6.7\times10^{-3}$	2200	Hot Pressing / Sintering

Dual-Chamber Vacuum Hot Pressing Sintering Furnace

P Series

High Production Efficiency / Good Temperature Uniformity /
Fast Heating Rate / High Pressure Accuracy /
Excellent Safety Performance

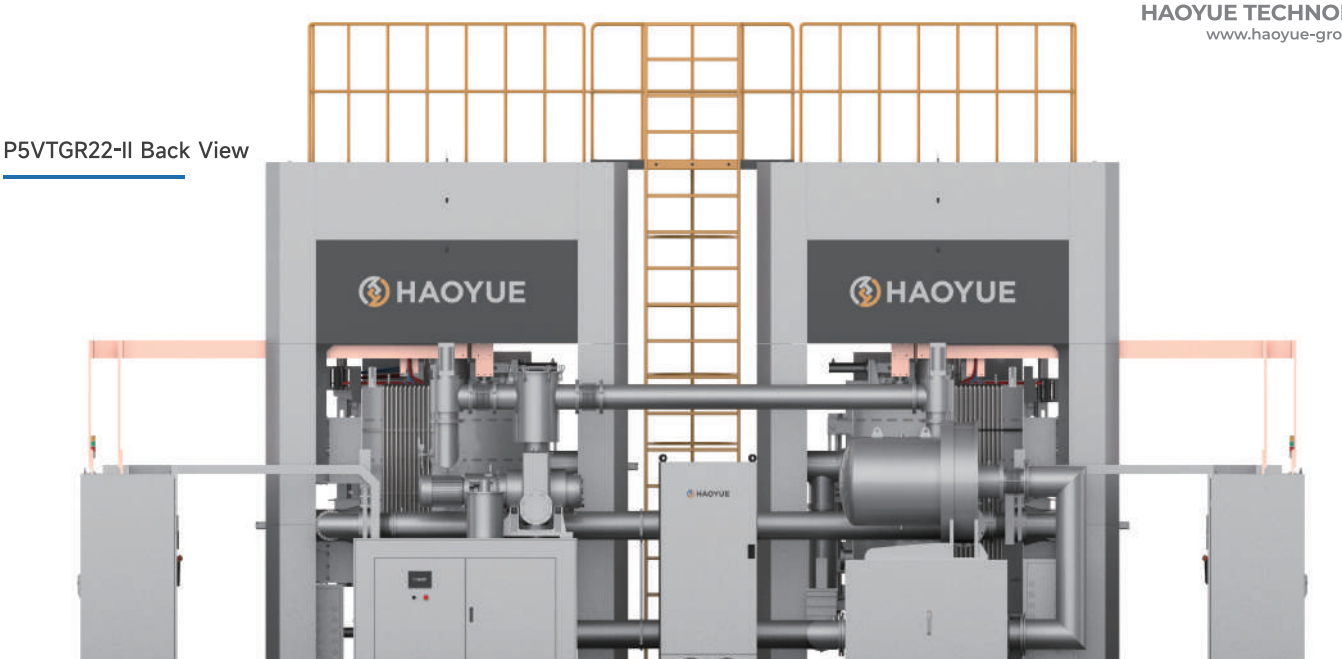
Introduction:

A vacuum hot-press sintering furnace is a complete set of equipment that forms materials by hot pressing under vacuum or other atmosphere conditions. The system primarily employs graphite resistance heating, with pressure heads driven by oil cylinders that apply downward and upward pressure. At high temperature, the solid particles in raw material billets achieve mutual bonding, promoting grain growth. Concurrently, voids (pores) and grain boundaries gradually decrease. Through matter transfer, the total volume contracts, density increases, and the material ultimately becomes a dense polycrystalline sintered body with specific microstructure, thereby compressing the material into final shape.

The furnace is designed in a one-to-two configuration with dual press machines and dual furnace bodies. The system features shared control systems, power systems, vacuum systems, and rapid cooling systems, resulting in compact footprint, low cost, and high efficiency.

P7VTGR22-II Front View

P5VTGR22-II Back View



Advantages:

- **High Production Efficiency:** Designed as a dual-press configuration sharing a single vacuum system, fast cooling system, furnace body, control system, and power system. Small footprint, low cost, high operational efficiency.
- **Vertical Side-Opening Door Structure:** Enables precise loading and unloading of molds with high accuracy and convenient operation.
- **Fast Heating Rate:** Heating rate of 1~10 °C/minute (below 1600 °C), heating rate of 1~5°C/minute (above 1600°C).
- **Optimized Design:** Thermal field of pressurized chamber calculated via thermal simulation, achieving very high temperature uniformity. Heating elements and insulation layers feature modular optimization design.
- **Good Temperature Uniformity:** Average temperature uniformity of ±5°C (measured at 5points, constant-temperature zone at 1000°C maintained for 2 hours before testing).
- **High Pressure Accuracy:** Servo-hydraulic control system with pressure accuracy of<±3‰.
- **Multi-Zone Temperature Control:** Multiple reserved temperature measurement holes enable real-time high-temperature monitoring.
- **Excellent Safety Performance:** Equipped with IPC + PLC + PID pressure sensor control for safe and reliable operation.
- **Superior Sealing Performance:** Dynamic pressure heads sealed with corrugated pipes ensure no air leakage.
- **Fast Cooling Rate:** Equipment supplied with external-circulation rapid cooling system. Achieves rapid cooling under 2 bar gas pressure after hot pressing, ensuring efficient operation.

Applications:

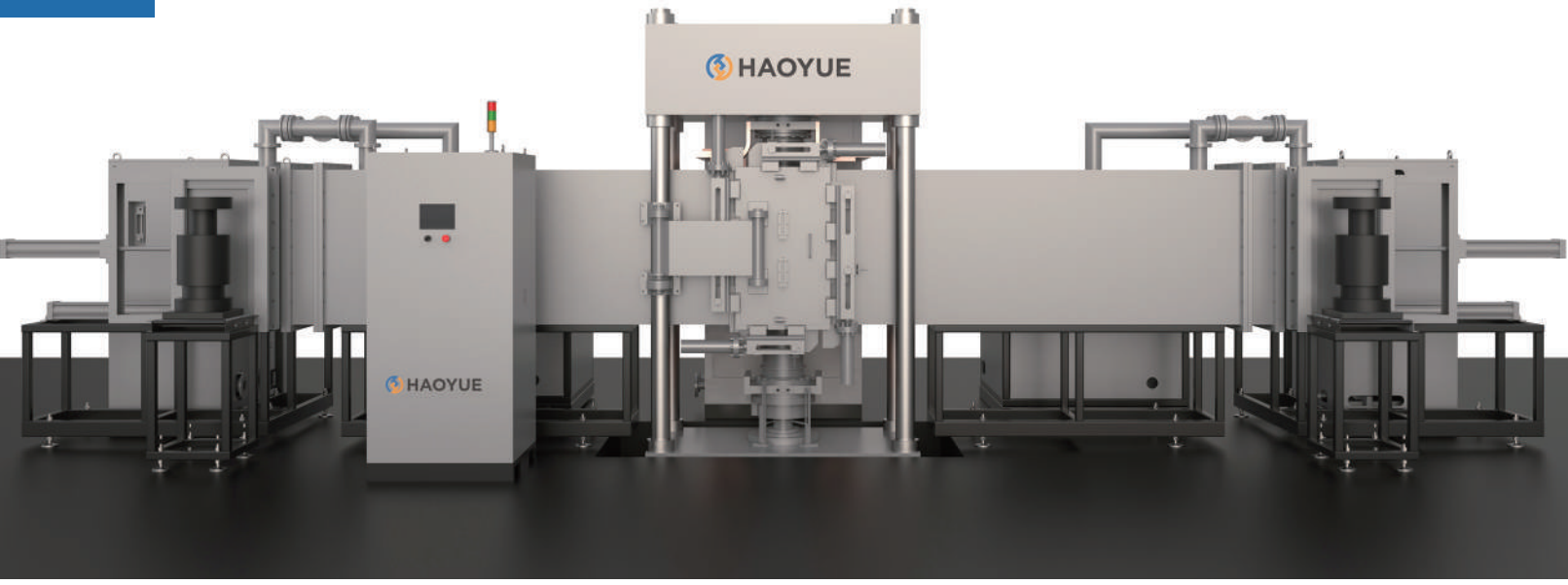
Suitable for high-temperature pressure sintering and densification of ceramic materials such as niobium oxide, silicon carbide, boron carbide, boron nitride, graphene carbon fiber, and high-temperature alloy metal powder materials in powder metallurgy and new functional ceramics. Also applicable for heat treatment of powder or compacts at temperatures below the melting point of the main component, achieving metallurgical bonding between particles to enhance strength.

Examples include: brake discs of iron-copper-based powder materials for aircraft landing gear, bulletproof vests, armored vehicle protective plates, and helicopter bulletproof armor.

Specifications & Parameters:

Model	Structure	Chamber Size (mm)	Sample Dia. (mm)	Mechanical Pressure (ton)	Ram Stroke (ton)	Ultimate Vacuum (Pa)	Max. Temp. (°C)	Applications
P5VTGR22-II	Double Chambers	Φ500×700	Φ300	300	Total Dual-stroke: 400mm	$1/6.7\times10^{-3}$	2200	Hot Pressing / Sintering
P7VTGR22-II	Double Chambers	Φ700×900	Φ400	600	Total Dual-stroke: 400mm	$1/6.7\times10^{-3}$	2200	Hot Pressing / Sintering

P7CGR22 Front View



Continuous Hot Press Sintering Furnace

P Series

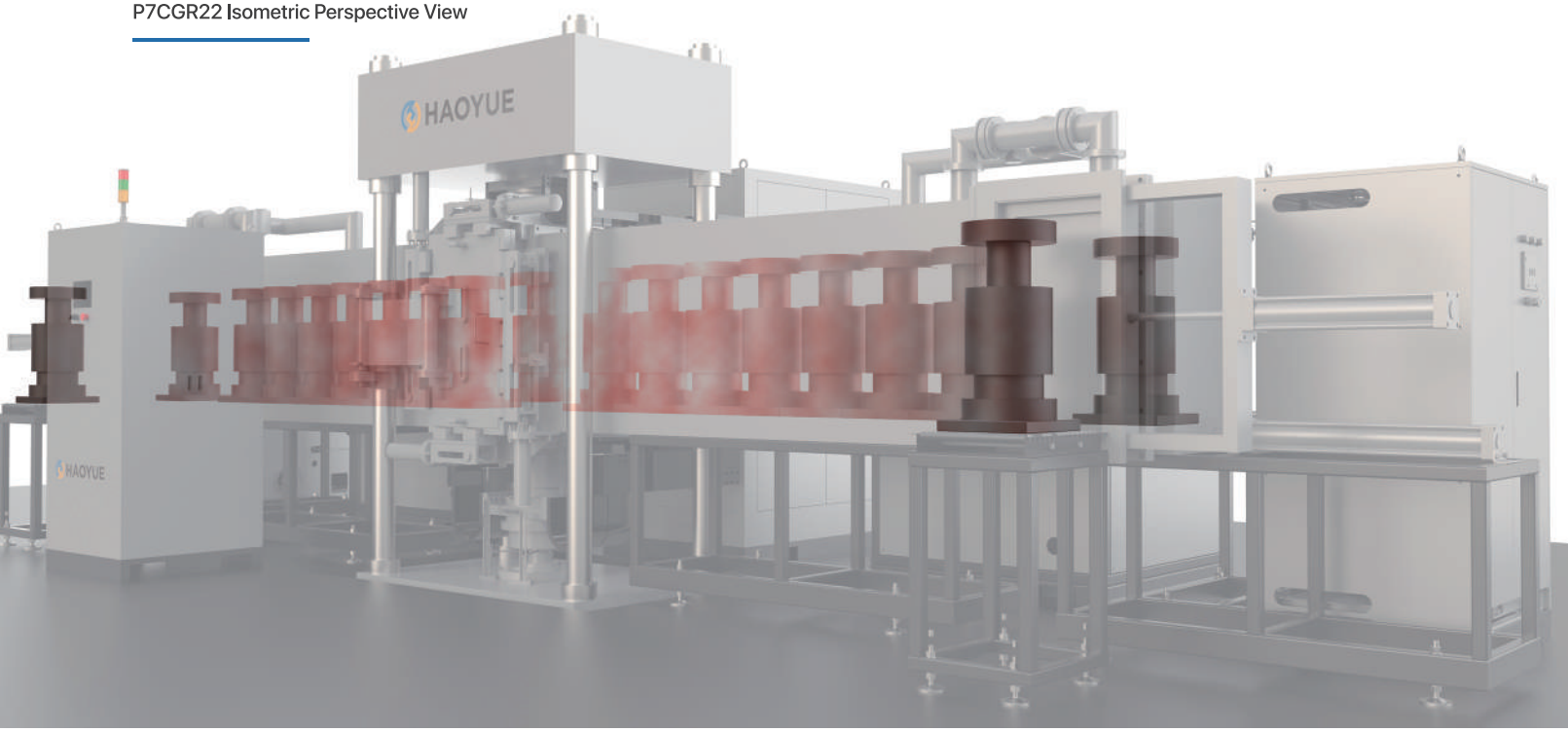
High Production Efficiency / High Degree of Automation /
Good Temperature Uniformity / Fast Heating Rate /
High Pressure Accuracy / Excellent Safety Performance

Introduction:

The continuous hot-press sintering furnace is a complete, continuous production system that forms materials through hot pressing under vacuum or other controlled atmospheric conditions. The equipment primarily employs graphite resistance heating, with pressure applied vertically by oil-cylinder-driven press heads. At elevated temperatures, solid particles in the raw material undergo mutual bonding, leading to grain growth while voids (pores) and grain boundaries progressively decrease. Through material transfer mechanisms, the total volume shrinks, density increases, and the material eventually becomes a dense, polycrystalline sintered body with defined microstructure, thereby achieving precision compression forming of the workpiece.

Continuous vacuum hot-pressing equipment offers substantial advantages, including advanced technology, high degree of production automation, large processing capacity, and consistent product quality. It significantly improves enterprise production efficiency and substantially reduces labor costs.

P7CGR22 Isometric Perspective View



Advantages:

- Adopting a multi-station design enables continuous production, resulting in doubled efficiency.
- **Fast Heating Rate:** Heating rate of 1~10°C/minute (<1600°C), heating rate of 1~5°C/minute (>1600°C).
- **Optimized Design:** The thermal field of the pressurized chamber has been verified through thermal-state simulation, demonstrating very high temperature uniformity. The heating elements and insulation layers are designed with modular optimization.
- **Good Temperature Uniformity:** Average temperature uniformity of ±5°C (measured at 5 points, after 1-hour constant-temperature dwell at 1000°C).
- **High Pressure Accuracy:** Using a servo-hydraulic control system, pressure accuracy is<±3%.
- **Multi-zone Temperature Control:** Multiple temperature measurement ports reserved for high-temperature monitoring.
- **Excellent Safety Performance:** Adopting industrial PC + PLC + PID pressure-sensing control for safe and reliable operation.
- **Superior Sealing Performance:** Dynamic pressure seals employ corrugated-tube design to ensure no air leakage.
- **High Degree of Automation:** Optional automatic loading/unloading system enables fully automated process execution, with digitalized and intelligent operation requiring no manual intervention.

Applications:

Suitable for high-temperature pressure sintering and densification of ceramic materials (niobium oxide, silicon carbide, boron carbide, boron nitride) and graphene, carbon-fiber, and high-temperature alloy metal powder materials; also suitable for high-temperature hot forming of new materials in powder metallurgy and functional ceramics. Can also be used for heat treatment of powder or compact materials at temperatures below the melting point of the main components, with the aim of improving strength through metallurgical bonding between particles.

Specifications & Parameters:

Model	Structure	Chamber Size (mm)	Sample Dia. (mm)	Mechanical Pressure (ton)	Ultimate Vacuum (Pa)	Max. Temp. (°C)	Applications
P5CGR22	Continuous	Φ500×500	Φ300	300	10	2200	Hot Pressing / Sintering
P7CGR22	Continuous	Φ700×600	Φ400	600	10	2200	Hot Pressing / Sintering

Vacuum Diffusion Bonlding Furnace

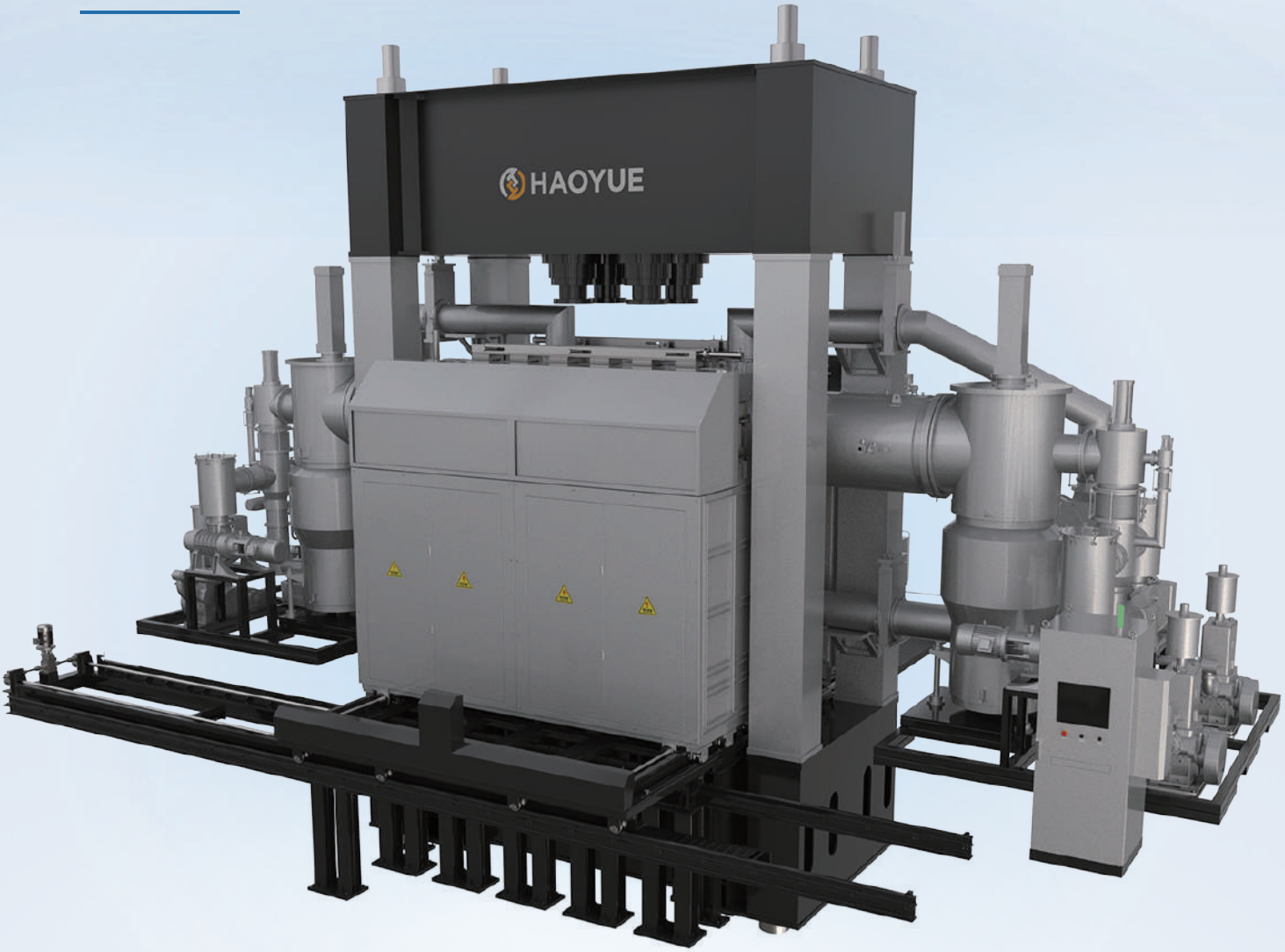
D Series

Good Temperature Uniformity / Fast Heating Rate /
High Pressure Accuracy / Excellent Safety Performance /
Fast Cooling Rate

Introduction:

Diffusion bonding refers to a solid-state bonding method in which a workpiece is pressurized at high temperature but does not produce visible deformation or relative movement. Diffusion bonding is especially suitable for joining dissimilar metal materials, heat-resistant alloys, and new materials such as ceramics, intermetallic compounds, and composite materials. Particularly for materials that are difficult to weld by fusion bonding methods, diffusion bonding offers obvious advantages and has increasingly attracted significant attention.

D20 Isometric View



Advantages:

- During diffusion bonding, because the substrate does not overheat or melt, it is possible to bond almost all metals or non-metals without reducing the performance of the bonded material. It is particularly suitable for materials that are difficult to bond by fusion bonding and other methods, such as active metals, heat-resistant alloys, ceramics, and composite materials. For the same type of material with poor plasticity or high melting point, as well as dissimilar materials that are immiscible or produce brittle intermetallic compounds during fusion bonding, diffusion bonding is a more suitable welding method.
- The quality of diffusion bonded joints is excellent, with microstructure and properties close to or identical to the base metal. There are no fusion bonding defects, overheating structure, or heat-affected zone in the bond seam. Bonding parameters are easy to precisely control, and joint quality and performance are stable during mass production.
- Bonded parts have high accuracy and minimal deformation. Because the pressure applied during bonding is relatively low, the workpiece is mostly heated as a whole and cooled with the furnace, resulting in minimal overall plastic deformation of the welded part. The welded workpiece is generally not subjected to mechanical processing after bonding.
- It is possible to bond large section workpieces. Since the bonding pressure required is not large, the tonnage of equipment required for large section bonding is not high, making it easy to achieve.
- It can bond workpieces with complex structures, difficult-to-access joints, and significant thickness differences, and can simultaneously weld many joints in assembled parts.
- **Fast Cooling Rate:** Optional rapid cooling system under 2 bar gas pressure ensures fast cooling of the workpiece after hot pressing and efficient operation.

Applications:

Diffusion bonding is especially suitable for small parts that require vacuum sealing, equal strength of joints and base metals, and no deformation. It is the only method to manufacture vacuum-sealed, heat-resistant, vibration-resistant, and deformation-free joints, and therefore is widely used in industrial production.
Diffusion bonding methods are used for bonding of metals and non-metals in electrovacuum equipment, and for bonding cemented carbide, ceramics, high-speed steel, and carbon steel in cutting tools.
Various titanium alloy components on supersonic aircraft are manufactured using the superplastic forming-diffusion bonding method.
Diffusion bonding is also particularly suitable for bonding dissimilar metal materials, non-metallic materials such as graphite and ceramics, dispersion-strengthened superalloys, metal matrix composites, and porous sintered materials.
Diffusion bonding has been widely applied in the manufacture of reactor fuel elements, hydraulic pump wear-resistant parts, drilling rig mud shoe parts, corrosion-resistant components, honeycomb structural plates, electrostatic equipment, impellers, stamping dies, filter tubes, and electronic components.

D4MO14 Isometric View

Specifications & Parameters:

Model	Chamber Size (mm)	Ultimate Vacuum (Pa)	Mechanical Pressure (ton)	Max. Temp. (°C)	Ram Qty.	Cooling Gas Pressure	Applications
D4MO14	400×400	6.7×10^{-4}	20~200	1400	1	2Bar	Diffusion Bonding
D5MO14	500×600	6.7×10^{-4}	30~300	1400	1	2Bar	Diffusion Bonding
D6MO14	600×800	6.7×10^{-4}	50~400	1400	2	2Bar	Diffusion Bonding
D8MO14	1200×800	6.7×10^{-4}	100~800	1400	4	2Bar	Diffusion Bonding
D10MO14	1200×1000	6.7×10^{-4}	300~1000	1400	4	2Bar	Diffusion Bonding

Vacuum Furnace(Graphite)

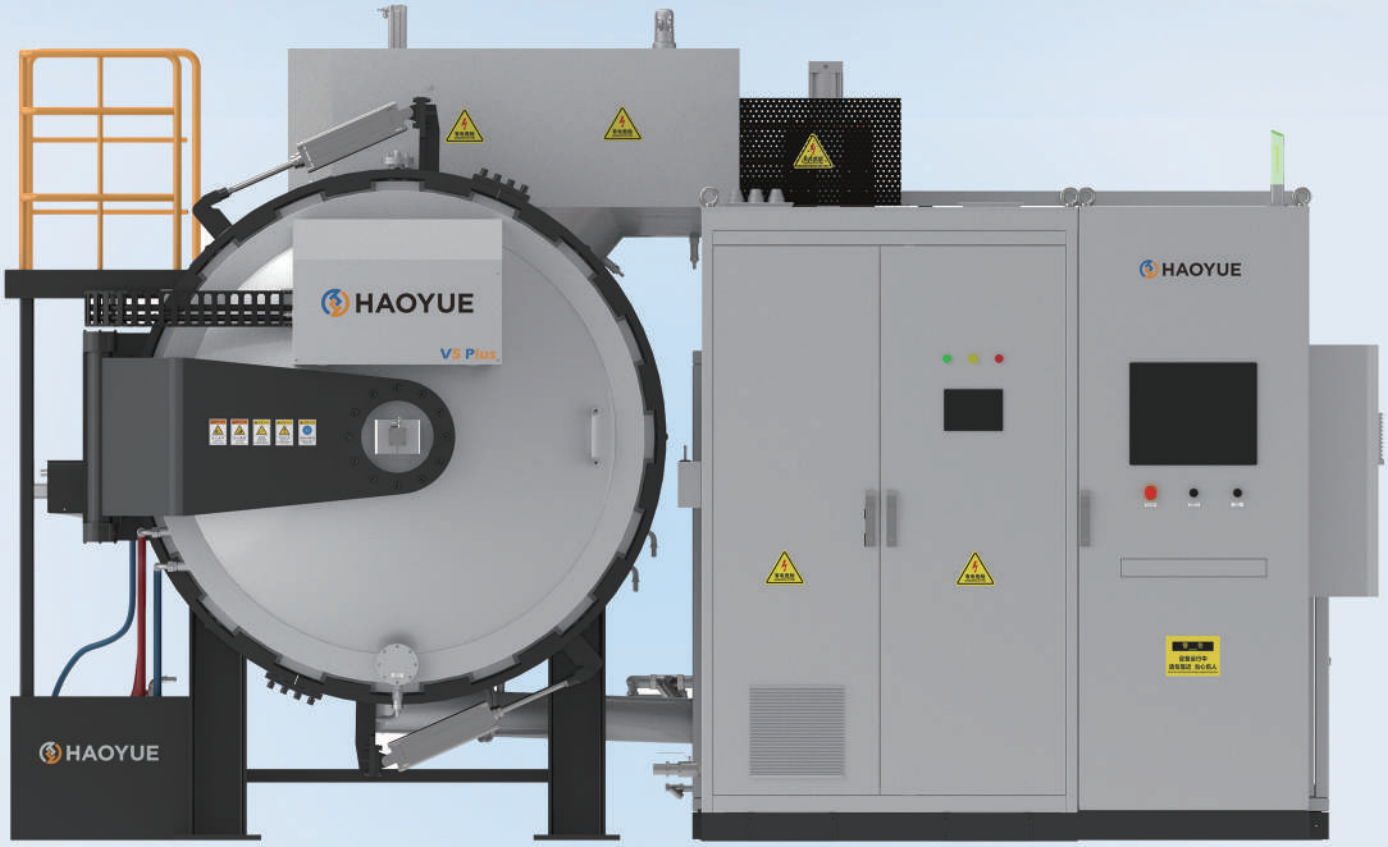
V Series

High Stability / Good Temperature Uniformity / Fast Heating Rate /
Excellent Safety Performance / Fast Cooling Rate

Introduction:

This vacuum furnace is a vacuum resistance furnace that uses graphite as the heating element. It is primarily designed for high-temperature sintering or annealing of ceramics, hard alloys, and composite materials in vacuum or protective atmospheres. The furnace is also suitable for high-temperature heat treatment of metal materials under high-vacuum conditions and for degassing treatment of precious metal materials.

V5GR24-Plus Front View



Advantages:

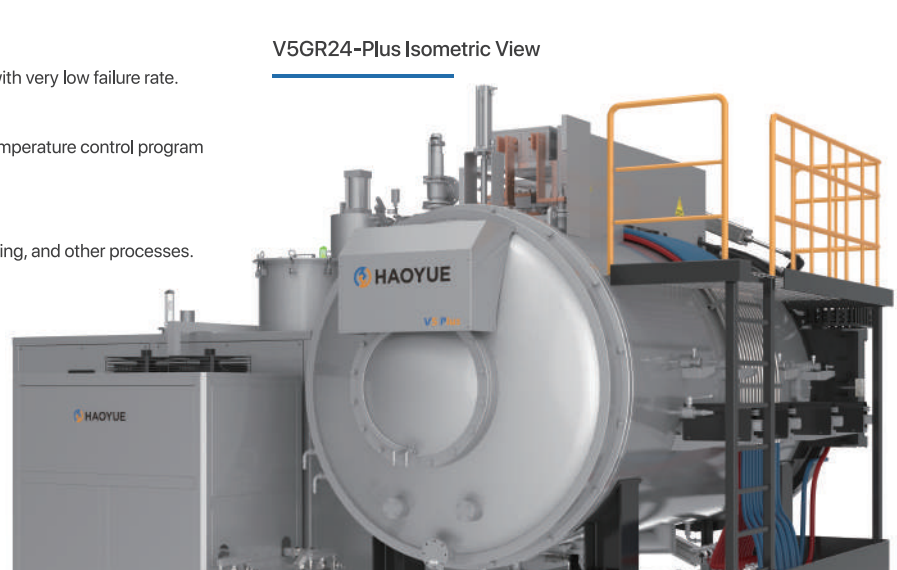
- **Horizontal Side-door Structure:**
  Loading and unloading materials is convenient and easy to operate.
- **Fast Heating Rate:**
  Heating rate of 1~15°C/minute (<1600°C);
  heating rate of 1~10°C/minute (>1600°C).
- **Optimized Design:**
  The heating chamber thermal field has been simulated and calculated under thermal conditions, exhibiting very high temperature uniformity. The heating elements and insulation layer employ modular optimization design.
- **Multi-zone Temperature Control:**
  Multiple temperature measurement ports are reserved for high-temperature monitoring purposes.
- **Good Temperature Uniformity:**
  Average temperature uniformity of ±5°C (5-point temperature measurement; isothermal zone at 1000°C maintained for 1 hour before detection).
- **Fast Cooling Rate:**
  Optional fast cooling system under 2bar gas pressure ensuring rapid workpiece cooling and efficient operation.
- **High Stability:**
  Equipment operates stably over extended periods with very low failure rate.
- **Excellent Safety Performance:**
  Employs industrial control computer + PLC + PID temperature control program for safe and reliable operation.
- **Strong Scalability:**
  Capable of sintering, annealing, degreasing, degassing, and other processes.

Applications:

This equipment is a batch-operation furnace suitable for sintering treatment of graphite electrodes, ceramics, and similar materials under high temperature and high vacuum conditions. It can also perform sintering under protective atmosphere conditions or conduct atmosphere-protected purification treatment of carbon fiber felt. Sintering processes have been widely applied across many industrial sectors, including alloy and metallurgical industries. Applications such as hard alloys, refractory materials, powder metallurgy, and ultra-high-temperature material sintering all require sintering technology.

Examples include: carbon/carbon brake discs, carbon/carbon plate materials, hot-pressing molds, high-temperature heating elements/fasteners, thermal field materials, graphite products, carbon paper, carbon cloth, graphene, carbon nanotubes, thermal conductive films, and more.

V5GR24-Plus Isometric View



Specifications & Parameters:

Model	Chamber Size (mm)	Ultimate Vacuum (Pa)	Max. Temp. (°C)	Applications
V3GR24	300×300×400	6.7×10^{-3}	2000/2400	Sintering/Annealing/ Degreasing
V4GR24	400×400×600	6.7×10^{-3}	2000/2400	Sintering/Annealing/ Degreasing
V6GR24	600×600×900	6.7×10^{-3}	2000/2400	Sintering/Annealing/ Degreasing
V7GR24	700×700×1000	6.7×10^{-3}	2000/2400	Sintering/Annealing/ Degreasing
V8GR24	800×800×1200	6.7×10^{-3}	2000/2400	Sintering/Annealing/ Degreasing

Vacuum Furnace (Moly)

V Series

High Stability / Good Temperature Uniformity / High Chamber Cleanliness / Fast Heating Rate / Excellent Safety Performance / Fast Cooling Rate / Strong Expandability

Introduction:

This vacuum furnace is a vacuum resistance furnace that uses molybdenum strips as heating elements, primarily applied for high-temperature sintering, annealing, and brazing of ceramics, hard alloys, composite materials, metal materials and other materials in vacuum or protective atmospheres. It can also be used for high-temperature heat treatment of metal materials under high vacuum conditions or degassing treatment of precious metal materials.

V7MO14 Isometric View

Advantages:

- **Horizontal and Side-opening Door Structure:**
  High loading and unloading accuracy; convenient operation.
- **Fast Heating Rate:**
  Heating rate of 1~15°C/minute (<1300°C).
- **Good Temperature Uniformity:**
  Average temperature uniformity of ±5°C (5-point temperature measurement; constant temperature zone at 1000°C maintained for 1 hour before measurement).
- **Multi-zone Temperature Control:**
  Multiple temperature measurement ports reserved for high-temperature monitoring purposes.
- **Excellent Safety Performance:**
  Utilizing industrial computer + PLC + PID program for temperature control; safe and reliable.
- **Good Design Optimization:**
  The heating chamber thermal field has undergone thermal state simulation and calculation, achieving very high temperature uniformity; heating elements and insulation layer employ modular optimization design.
- **Fast Cooling Rate:**
  Optional fast cooling system under2bar gas pressure available to ensure rapid workpiece cooling and efficient operation.
- **Strong Scalability:**
  Capable of sintering, brazing, annealing, degreasing, deoxidation, degassing, reduction, and other processes.

Applications:

High vacuum molybdenum-strip furnace is mainly used for sintering, annealing, vacuum brazing, degassing, and other processes for materials such as non-ferrous metals, stainless steel, titanium alloys, high-temperature alloys, hard alloys, etc.

V7MO14 Isometric View

Specifications & Parameters:

Model	Chamber Size (mm)	Ultimate Vacuum (Pa)	Max. Temp. (°C)	Applications
V4MO13	400×400×600	6.7×10^{-4}	1000/1300	Sintering / Annealing / Hydrogen Degreasing / Brazing / Degassing
V6MO13	600×600×900	6.7×10^{-4}	1000/1300	Sintering / Annealing / Hydrogen Degreasing / Brazing / Degassing
V7MO13	700×700×1000	6.7×10^{-4}	1000/1300	Sintering / Annealing / Hydrogen Degreasing / Brazing / Degassing
V8MO13	800×800×1200	6.7×10^{-4}	1000/1300	Sintering / Annealing / Hydrogen Degreasing / Brazing / Degassing
V10MO13	1000x1000x1400	6.7×10^{-4}	1000/1300	Sintering / Annealing / Hydrogen Degreasing / Brazing / Degassing

Vacuum Furnace (Tungsten)

V Series

High Stability / Good Temperature Uniformity / High Chamber Cleanliness / Fast Heating Rate / Excellent Safety Performance / Fast Cooling Rate / Strong Expandability

Introduction:

This vacuum furnace is a vacuum resistance furnace that uses tungsten strips as heating elements. It is mainly applied for high-temperature sintering and annealing of ceramics, hard alloys, composite materials, and similar materials under vacuum or protective atmosphere. It can also be used for high-temperature heat treatment of metal materials under high vacuum conditions or for degassing of precious metal materials.

V4W20 Isometric View

Advantages:

- **Horizontal Side-opening Door Design:**
  High loading and unloading accuracy, convenient operation
- **Fast Heating Rate:**
  Heating rate 1~15°C/minute (below 1600°C);
  heating rate 1~10°C/minute (above 1600°C)
- **Good Temperature Uniformity:**
  Average temperature uniformity ±5°C (5-point measurement, constant-temperature zone at 1000°C after 1-hour stabilization)
- **Excellent Safety Performance:**
  Employs industrial control computer + PLC + PID programmable temperature control, safe and reliable
- **Optimized Design:**
  Heating chamber thermal field verified through thermal simulation, delivering very high temperature uniformity; heating elements and insulation layer employ modular optimization
- **High Automation:**
  Multi-parameter recording and monitoring, user-friendly human-machine interface, stable operation
- **Fast Cooling Rate:**
  Optional rapid cooling system operating at 2bar gas pressure ensures rapid workpiece cooling and efficient operation
- **Strong Scalability:**
  Capable of sintering, annealing, brazing, degassing, hydrogen atmosphere treatment, and more.

Applications:

Mainly used for vacuum sintering of metal powder products, metal wire mesh products, ceramic cemented carbides, new materials, and composite materials. Applied to high-temperature sintering of metals such as transparent ceramics and technical ceramics, as well as alloy materials composed of refractory metals and ceramic materials including silicon carbide and silicon nitride.

V4W20 Isometric View

Specifications & Parameters:

Model	Chamber Size (mm)	Ultimate Vacuum (Pa)	Max. Temp. (°C)	Applications
V3W20	300×300×400	6.7×10^{-4}	1800/2000	Sintering / Annealing / Degreasing / Brazing / Degassing
V4W20	400×400×600	6.7×10^{-4}	1800/2000	Sintering / Annealing / Degreasing / Brazing / Degassing
V5W20	500×500×700	6.7×10^{-4}	1800/2000	Sintering / Annealing / Degreasing / Brazing / Degassing
V6W20	600×600×900	6.7×10^{-4}	1800/2000	Sintering / Annealing / Degreasing / Brazing / Degassing

Vacuum Furnace (Induction)

V Series

Good Temperature Uniformity / Fast Heating Rate /
Excellent Safety Performance / Fast Cooling Rate

Introduction:

Vacuum induction furnaces employ induction heating technology and are primarily used for high-temperature sintering and annealing of ceramics, hard alloys, composite materials, and similar materials in vacuum or protective atmospheres. They can also be utilized for high-temperature heat treatment of metallic materials under high-vacuum conditions or for degassing treatment of precious metal materials.

The equipment features advanced and rational structural design. Its design and manufacture comply with applicable national and industry standards and specifications, meeting all user requirements. Accompanying products and components are at the international advanced level and are suited for sustained, stable, safe, and reliable production operations.

The equipment delivers excellent energy efficiency. It is convenient and simple to use, operate, and maintain; features an attractive appearance; operates safely and reliably; and is backed by superior after-sales service.

V6CO24 Isometric View

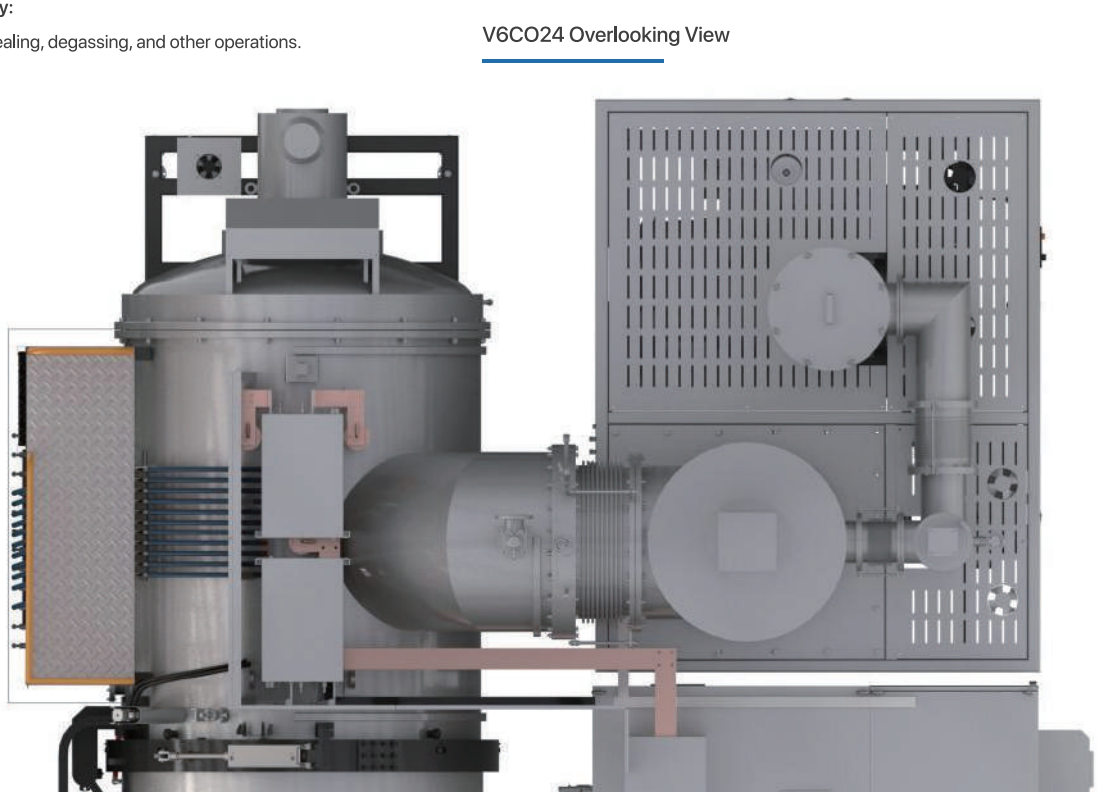
Advantages:

- **Horizontal Side-opening Door Structure:**
  Ensures high loading and unloading accuracy with convenient operation.
- **Fast Heating Rate:**
  Heating rate of 1~60°C/min (below 1600°C),
  heating rate of 1~20°C/min (above 1600°C).
- **Multi-temperature Zone Control:**
  Multiple temperature measurement ports reserved for high-temperature monitoring.
- **Excellent Safety Performance:**
  Employs IPC+PLC+PID programmable temperature control for safe and reliable operation.
- **Optimized Design:**
  Induction thermal field in the heating chamber has been validated via thermal simulation; delivers very high temperature uniformity. Heating elements and insulation layers incorporate modular optimization design.
- **Expandable Functionality:**
  Capable of sintering, annealing, degassing, and other operations.

Applications:

This vacuum furnace operates on a periodic batch basis and is suitable for sintering treatment of graphite electrodes, ceramics, and similar materials under high-temperature, high-vacuum conditions. It can also perform sintering operations under a protective atmosphere. The furnace is widely deployed across many industrial sectors, including steel, metallurgy, and ceramics, and serves applications such as hard alloys, ceramics, refractory materials, powder metallurgy, and ultra-high-temperature material firing.

V6CO24 Overlooking View



Specifications & Parameters:

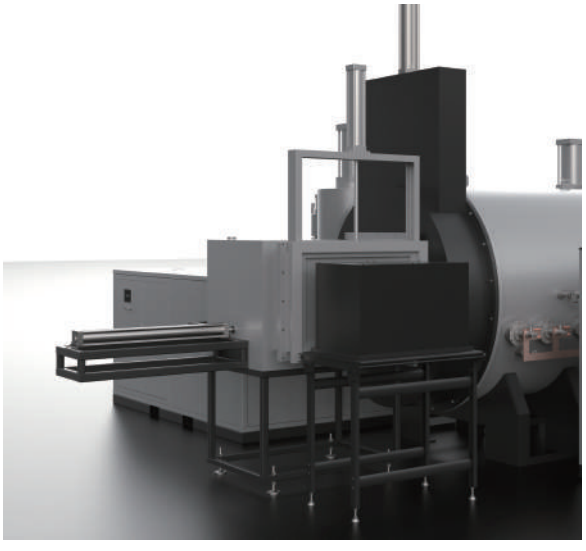
Model	Chamber Size (mm)	Ultimate Vacuum (Pa)	Max. Temp. (°C)	Applications
V6CO24	600×600×900	5	2000/2400	Sintering / Annealing / Degreasing
V8CO24	800×800×1200	5	2000/2400	Sintering / Annealing / Degreasing

V6CGR20 Isometric View

Continuous Vacuum Furnace (Graphite)

V Series

High Production Efficiency / Good Temperature Uniformity / Fast Heating Rate / Excellent Safety Performance / High Degree Of Automation



Introduction:

This continuous vacuum furnace is a vacuum resistance furnace that uses graphite as the heating element. It is mainly used as a complete set of equipment for high-temperature sintering or annealing of ceramics, hard alloys, composite materials, and other materials in vacuum or protective atmosphere. It can also be used for high-temperature heat treatment of metal materials under high vacuum conditions or degassing treatment of precious metal materials.

Continuous vacuum furnaces feature advanced technology, high degree of production automation, large processing capacity, and excellent heat-treated product quality. They significantly improve production efficiency and reduce labor costs.

V6CGR20 Isometric Perspective View

Advantages:

- Adopting a multi-station design, continuous production can be achieved, resulting in doubled efficiency.
- **Fast Heating Rate:** Heating rate of 1~10°C/minute (below 1600°C), heating rate of 1~5°C/minute (above 1600°C).
- **Good Design Optimization:** The heating chamber thermal field has been thermally simulated and calculated, providing very high temperature uniformity. The heating elements and insulation layer employ modular optimization design.
- **Good Temperature Uniformity:** Average temperature uniformity of ±5°C (5-point temperature measurement, after 1 hour of thermal stabilization at 1000°C).
- **Multi-zone Temperature Control:** Multiple temperature measurement ports are provided for high-temperature monitoring.
- **Excellent Safety Performance:** Features an industrial control computer + PLC + PID program-based temperature control, ensuring safe and reliable operation.
- **High Degree of Automation:** Optional automatic loading and unloading system enables fully automated operation of all processes, delivering digitalization and intelligent control with no manual intervention required.
- **Versatile:** Suitable for sintering and annealing applications.

Applications:

This equipment is a continuous-operation furnace designed for sintering of graphite electrodes, ceramics, and similar materials under high-temperature, high-vacuum conditions. It can also operate under a protective atmosphere and can perform protective-atmosphere treatment and purification of carbon fiber felt.

Sintering technology is widely applied across numerous industrial sectors, including steel, metallurgy, and ceramics. Applications requiring sintering processes include hard alloys, ceramics, refractory materials, powder metallurgy, and ultra-high-temperature materials firing. Typical products include carbon / carbon brake discs, carbon/carbon plate stock, crystal-furnace hot zones, hot-press molds, high-temperature heating elements/fasteners, thermal field materials, graphite products, carbon paper, carbon cloth, graphene, carbon nanotubes, and thermally conductive films.

Specifications & Parameters:

Model	Chamber Size (mm)	Ultimate Vacuum (Pa)	Max. Temp. (°C)	Applications
V6CGR20	600×600×900	10	2000	Sintering / Annealing
V8CGR20	800×800×1200	10	2000	Sintering / Annealing

Vacuum Hydrogen Furnace

H Series

Excellent Safety Performance / Good Temperature Uniformity /
Fast Heating Rate / High Temperature Control Accuracy

Vertical Structure

HV65/320 Front View

Introduction:

The vacuum hydrogen furnace is a specialized heat treatment equipment that integrates vacuum and hydrogen atmosphere environment. It eliminates air inside the furnace through a vacuum system and introduces hydrogen gas as a protective or reducing atmosphere. Utilizing efficient heating elements (molybdenum strip heating) and a precise temperature control system, it achieves exact control of temperature and atmosphere. Haoyue Technology's equipment is characterized by strong safety performance, high heating efficiency, good temperature uniformity, and equipment stability. It is widely used in fields such as metal material heat treatment, ceramic sintering, powder metallurgy, and electronic material preparation, providing reliable guarantees for improving material performance.

Applications:

Equipment for annealing and purifying metal parts used in ceramic sintering, metallization, brazing, and glass component sealing.
Primarily used for heat treatment of tool steel, mold steel, high-speed steel, ultra-high strength steel, magnetic materials, stainless steel, and non-ferrous metals under hydrogen atmosphere conditions.

Advantages:

- The furnace body adopts a vertical/horizontal structure. The columnar design of the furnace liner ensures uniform gas flow distribution and uniform service life. The outer shell is made of double-layer SUS304 stainless steel material.
- The heating element adopts molybdenum strip with excellent mechanical properties at high temperatures. Its surface load is determined within a reasonable range. The furnace body employs proprietary design structure for fast heat transfer, easy maintenance and replacement.
- **Fast Heating Rate:**
  Heating rate of 1~15°C/minute (up to 1300°C).
- **Excellent Design Optimization:**
  The thermal field of the heating chamber is calculated through thermal state simulation, demonstrating very high temperature uniformity. The heating elements and insulation layer are designed with modular optimization.
- This equipment offers low investment, low operating cost, simple installation, convenient use and maintenance, high safety performance, and excellent control characteristics.
- **Excellent Safety Performance:** Equipped with fault alarms for overtemperature and overpressure conditions, mechanical automatic pressure protection, action interlocking, and other safety functions ensuring high equipment reliability.

H4MO13 Front View

Specifications & Parameters:

Model	Structure	Chamber Size (mm)	Heater	Loading	Ultimate Vacuum (Pa)	Max. Temp. (°C)
HV65/120	Vertical	Φ650×1200	MO	Bottom Loading	6.7×10^{-1}	1000/1300
HV65/320	Vertical	Φ650×3200	MO	Top Loading	6.7×10^{-1}	1000/1300
H4MO13	Horizontal	400×400×600	MO	Side Loading	6.7×10^{-1}	1000/1300
H6MO13	Horizontal	600×600×900	MO	Side Loading	6.7×10^{-1}	1000/1300
H7MO13	Horizontal	700×700×1000	MO	Side Loading	6.7×10^{-1}	1000/1300
H8MO13	Horizontal	800×800×1200	MO	Side Loading	6.7×10^{-1}	1000/1300

Gas Pressure Sintering Furnace (Horizontal)

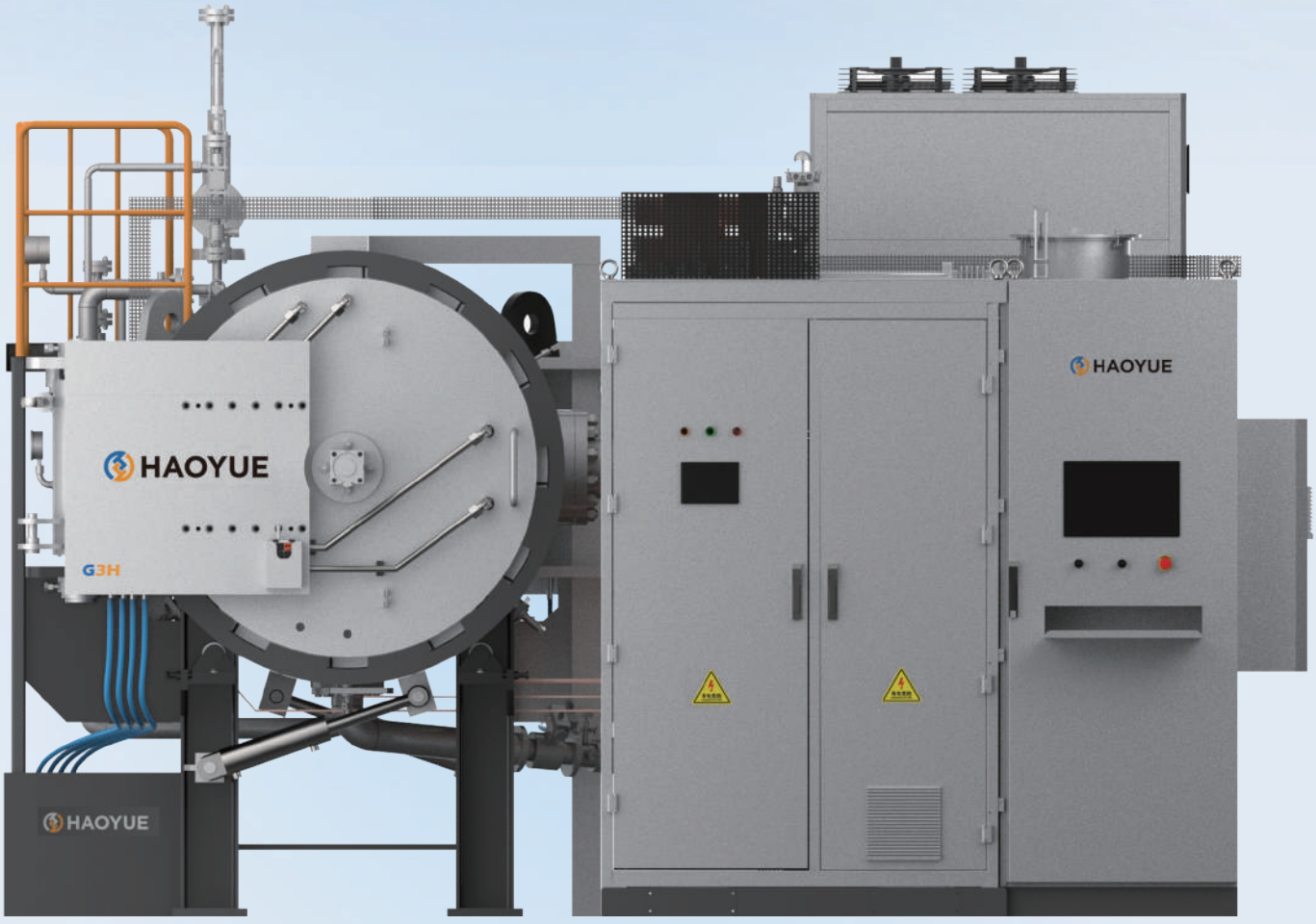
G Series

Good Temperature Uniformity / Fast Heating Rate /
Excellent Safety Performance / Controllable Microstructure

Introduction:

The pressure sintering furnace series integrates positive pressure dewaxing, vacuum dewaxing, vacuum sintering, partial pressure sintering, pressure sintering, atmosphere control, and cooling functions into a single system. This product is a cycle-operation type, suitable for materials such as silicon nitride ceramic balls and ceramic cutting tools sintering in high-pressure nitrogen or nitrogen atmosphere. This is beneficial for increasing the sintering density of materials and improving their mechanical properties. Multiple loading designs make loading, unloading, and maintenance work more convenient. The entire process is automatically controlled.

G3H Front View



Advantages:

- Horizontal design makes loading, unloading, and maintenance work more convenient; automatic control throughout the entire process.
- **Good Temperature Uniformity:**
  Adopts special furnace liner structure and heater arrangement to achieve excellent furnace temperature uniformity.
- **Good Debinding Effect:**
  Uses special structure debinding chamber with excellent sealing performance; debinding is complete and causes no contamination to internal furnace components.
- **Multifunctional:**
  Equipped with vacuum sintering, pressure sintering, and negative pressure debinding functions.
- **Good Design Optimization:**
  The heating chamber thermal field is subject to thermal-state simulation and calculation with very high temperature uniformity; configured heating elements and insulation layer employ modular optimization design.
- **Excellent Safety Performance:**
  Equipped with fault alarms for overtemperature and overpressure, mechanical automatic pressure protection, action interlocking, and other safety functions. Equipment can optionally be configured with a debinding system to achieve one-time integrated debinding-sintering treatment of ceramic products.

Applications:

Under high-pressure protective atmosphere conditions, ceramics (such as silicon carbide, zirconia, alumina, silicon nitride, etc.) and metal materials (such as hard alloys) are subjected to hot isostatic press sintering treatment. Also suitable for pilot-scale batch production in colleges and research institutions. Suitable for sintering materials such as silicon nitride ceramic balls and ceramic cutting tools in high-pressure nitrogen or argon atmosphere. Beneficial for increasing material sintering density and improving material mechanical properties.

G3H Isometric View

Specifications & Parameters:

Model	Structure	Chamber Size (mm)	Heater	Loading	Gas Pressure (MPa)	Ultimate Vacuum (Pa)	Max. Temp. (°C)	Applications
G3H	Horizontal	300×300×1000	GR	Side Loading	6/10	10	1600/2000	Gas Pressure Sintering / Partial Pressure Sintering / Degreasing
G5H	Horizontal	500×500×1800	GR	Side Loading	6/10	10	1600/2000	Gas Pressure Sintering / Partial Pressure Sintering / Degreasing

Gas Pressure Sintering Furnace (Vertical)

G Series

Good Temperature Uniformity / Fast Heating Rate /
Excellent Safety Performance / Controllable Microstructure

G5V Isometric View

Introduction:

The gas-pressure sintering furnace series integrates positive-pressure dewaxing, vacuum dewaxing, vacuum sintering, partial-pressure sintering, pressure sintering, atmosphere control, and cooling functions into one complete system. This is a batch-operation furnace suitable for sintering materials such as silicon nitride ceramic balls and ceramic cutting tools in a high-pressure nitrogen or argon atmosphere. This approach increases the sintering density of materials and improves their mechanical properties. Multiple loading designs enable convenient loading, unloading, and maintenance operations. The entire process is automatically controlled.

Applications:

Under high-pressure protective atmosphere conditions, this equipment is suitable for hot isostatic press (HIP) sintering of ceramics (such as silicon carbide, zirconia, alumina, silicon nitride, and others) and metal materials (such as hard metal alloys). The equipment is also well-suited for pilot-scale batch production in colleges and research institutions. It is applicable for sintering materials such as silicon nitride ceramic balls and ceramic cutting tools under high-pressure nitrogen or argon atmospheres. This process effectively increases material sintering density and enhances mechanical properties.

Advantages:

- Vertical design simplifies loading, unloading, and maintenance operations. The entire process cycle is controlled automatically.
- **Good Temperature Uniformity:** Employs a specialized furnace liner structure and optimized heater arrangement to achieve superior temperature uniformity throughout the hot zone.
- **Excellent Debinding Effect:** Features a specially designed debinding chamber with superior sealing performance. Debinding is complete with no contamination of furnace components.
- **Multifunctional Capabilities:** Equipped with vacuum sintering, pressure sintering, and negative pressure debinding functions.
- **Optimized Design:** The heating chamber thermal field has been validated through thermal simulation analysis, providing exceptionally high temperature uniformity. Heating elements and insulation layers are designed with modular optimization for maximum efficiency.
- **High Safety Level:** Incorporates fault alarms for overtemperature and overpressure conditions, mechanical automatic pressure protection, and interlock functions for comprehensive equipment safety.
- **Optional Debinding System Configuration:** Enables single-stage debinding and sintering treatment for ceramic components.

G3V Isometric View

Specifications & Parameters:

Model	Structure	Chamber Size (mm)	Heater	Loading	Gas Pressure (MPa)	Ultimate Vacuum (Pa)	Max. Temp. (°C)	Applications
G3V	Vertical	Φ350×700	GR	Bottom Loading	6/10	10	1600/2000	Gas Pressure Sintering / Partial Pressure Sintering / Degreasing
G5V	Vertical	Φ500×1000	GR	Bottom Loading	6/10	10	1600/2000	Gas Pressure Sintering / Partial Pressure Sintering / Degreasing

Hot Isostatic Pressing

I Series

Good Design Optimization / Good Temperature Uniformity /
Fast Heating Rate / High Pressure Accuracy /
Excellent Safety Performance

I10MO14 Isometric View

Introduction:

Hot Isostatic Pressing (HIP) is a specialized heat treatment process for metal and ceramic materials, and an important means for preparing high-performance materials. This process technology can be applied to powder metallurgy forming or densification treatment of formed castings (such as titanium alloys, high-temperature alloys, aluminum alloys, and other porous or shrinkage-cavity castings). Using inert gas as the pressure transfer medium, uniform pressure is applied to the part surface from all directions, eliminating inherent internal defects in the product process, such as porosity, internal cracks, and local looseness. This approach improves the overall mechanical properties of the parts, especially fatigue resistance, while simultaneously reducing costs and improving energy efficiency. After HIP treatment, the material's wear resistance, corrosion resistance, and mechanical properties are greatly enhanced, with fatigue life potentially increased by 10-100 times.

Applications:

High-temperature alloys, titanium alloys, aluminum alloys, copper alloys, refractory metals, cemented carbides, stainless steel, corrosion-resistant alloys, ceramics, composite materials, electronic materials, functional materials, and more.

I5CC20 Isometric View

Advantages:

Versatile Uses:

HIP: Powder metallurgy, densification, diffusion bonding.

HIP Powder Metallurgy:

- **Design Flexibility:** Design to nearly the same shape as the final product, reducing raw material waste, machining procedures, and transportation time. Fine grain structure with isotropic properties and extended service life.
- Internal uniform density with no impact on ultrasonic inspection.
- No liquid phase generated—minimizes segregation to the maximum extent and improves material corrosion resistance.
- Can prepare ingot blanks from two different metallic materials—bimetal can still undergo subsequent forging and extrusion processing.

Densification Treatment:

- Elimination of internal defects: shrinkage porosity, shrinkage cavities, and segregation eliminated.
- Greatly improves fatigue life by 10 to 100 times.
- Improved ductility and fracture toughness.
- Products can reach theoretical density.
- Wear resistance and corrosion resistance greatly improved.
- Eliminates internal stresses in the material.

Diffusion Bonding:

- Connects parts with complex contact surfaces and achieves strict dimensional control.
- Joins multiple homogeneous or dissimilar materials in a single process.
- Rapidly achieves large-area connections.
- Enables solid-state connections for brittle metals that cannot be joined by conventional welding methods, and for metals with large melting point differences.
- High and uniform isostatic pressure reduces and eliminates microscopic porosity or cracks on the outer edge of the connection zone.
- Produces no defects such as welds, heat-affected zones, surface porosity, inclusions, undercuts, cracks, or other defects generated in traditional welding processes.

Specifications & Parameters:

Model	Structure	Chamber Size (mm)	Heater	Loading	Gas Pressure (MPa)	Ultimate Vacuum (Pa)	Max. Temp. (°C)	Applications
I5CC20	Vertical	Φ500×1000	C/C	Top Loading	100/150/200	100	2000	Hot Isostatic Sintering
I10MO14	Vertical	Φ1000×2000	MO	Top Loading	100/150/200	100	1400	Hot Isostatic Sintering

Chemical Vapor Deposition Furnace (CVD/CVI)

C Series

High Equipment Stability / Good Temperature Uniformity /
Fast Heating Rate / High Control Accuracy /
Excellent Safety Performance

C8VGR16 Isometric View

Introduction:

Thermal-induced chemical vapor deposition (CVD) is a powerful method for depositing protective coatings on various dielectrics, semiconductors, and metal materials in single crystal, polycrystalline, amorphous, or epitaxial states, in large or small forms. Typical coating materials include pyrolytic carbon, silicon carbide, and boron nitride. By using synthetic precursors, the coatings are highly pure and meet the typical requirements of the semiconductor industry. Depending on process parameters, multiple layer thicknesses are achievable, ranging from single or several atomic layers to solid protective or functional layers with thicknesses from 10 nanometers to hundreds of micrometers, as well as monolithic components with thicknesses up to 100 micrometers and even several millimeters.
Thermal-induced chemical vapor infiltration (CVI) is a technique related to CVD that infiltrates porous or fiber preforms into a matrix material to prepare composite components with improved mechanical properties, corrosion resistance, heat shock resistance, and low residual stress.

Applications:

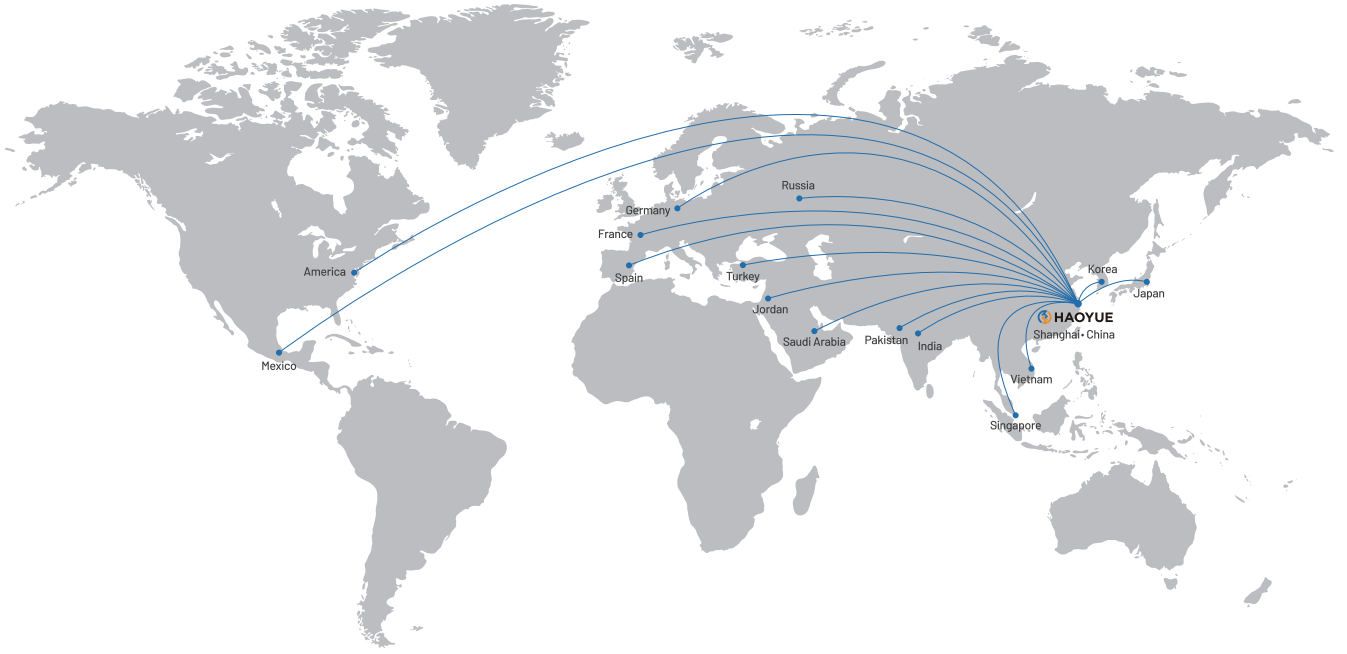
Chemical vapor deposition furnaces (silicon carbide) can be used for surface oxidation-resistant coatings and matrix modification of materials using silane as the gas source. Vertical chemical vapor deposition furnaces (pyrolytic carbon) can be used for isothermal CVD/CVI treatment of material surfaces or substrates using hydrocarbon gases (such as C_3H_8, CH_4, etc.) as carbon sources.
Vertical chemical vapor deposition furnaces (SiC, BN) can be used for surface coating, matrix modification, and composite material preparation, including substrates for epitaxial wafers, high-temperature refractory materials for crystal furnaces, hot-bending molds, semiconductor crucibles, and ceramic-matrix composite materials.

Advantages:

- **Vertical Design With Bottom/Top Door-opening Structure:**
  High loading and unloading precision, easy operation.
- **Advanced Control Technology:**
  Precise control of MTS flow and pressure; stable deposition airflow in the furnace chamber with minimal pressure fluctuation range
- **Excellent Temperature Uniformity:**
  Average temperature uniformity of ±5°C.
- **Multi-channel Deposition Gas Path:**
  Uniform flow field, no deposition dead zones, superior deposition performance.
- **Fully Enclosed Deposition Chamber:**
  Excellent sealing effect, strong contamination resistance.
- **Excellent Safety Performance:**
  Programmable temperature control using industrial control computer + PLC + PID ensures safe and reliable operation.
- Effective treatment of highly corrosive exhaust gas, flammable and explosive gases, solid dust, and low melting point viscous products generated during deposition.
- **Multi-stage Efficient Exhaust Gas Treatment System:**
  Environmentally friendly, efficient collection of tar and byproducts, easy to clean.
- **Corrosion-resistant Vacuum Unit Design:**
  Long continuous working time, extremely low maintenance rate.

Specifications & Parameters:

Model	Chamber Size (mm)	Ultimate Vacuum (Pa)	Max. Temp. (°C)	Applications
C4VGR16	Φ500×600	5	1600	CVD/CVI
C6VGR16	Φ800×900	5	1600	CVD/CVI
C7VGR16	Φ1000×1000	5	1600	CVD/CVI
C8VGR16	Φ1100×1200	5	1600	CVD/CVI



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