

Diffusion Bonding in High-Vacuum Hot-Presses

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Resistance Heated High Vacuum Heat Treatment Furnace with Integrated Pressing Unit

Universal use for thermal treatments and processes where particularly demanding atmosphere requirements and sophisticated materials are involved.

Process Applications

Heat Treatment

- Bright and stress-free annealing
- Degassing and cleaning
- Sintering processes
- Annealing processes
- Vacuum Brazing / Active Brazing

Hot Press

- Diffusion bonding / welding
- Product fixing by means of a pressing force
- Application of a homogenous pressing force for optimum vacuum brazing processes

Standard Configurations

Type	Pressing Plate Dimensions	Pressure
COV 323 HP	300 x 300 mm ²	800 kN
MOV 353 HP	200 x 200 mm ²	500 kN
MOV 653 HP	600 x 800 mm ²	1,000 kN
MOV 653 HP	600 x 800 mm ²	2,500 kN
MOV 853 HP	900 x 1,000 mm ²	4,000 kN

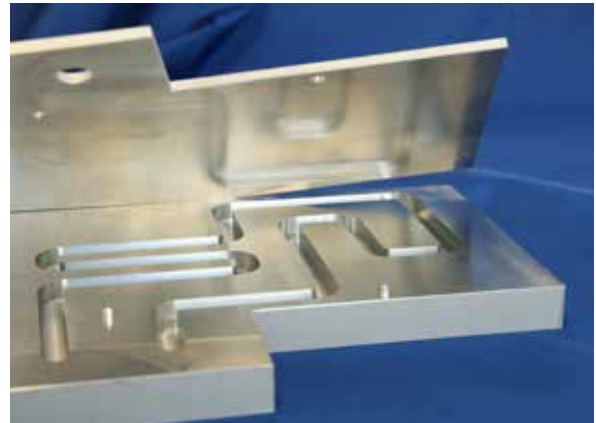


Special Features and System Advantage

- **System design:**
 - o Cold-wall furnaces with an integrated hydraulic pressing unit
 - o Vessel made of stainless steel, double walled and water cooled
 - o Full metal or graphite heating insert available
 - o Resistance heated chamber – heating of pressing plate by radiation
 - o Pressing plates made of TZM or CFC
 - o Thermal insulation metal sheets
 - o Multi and single pillar design
- **Process features:**
 - o Up to 1,700°C operating temperature (1,200°C under pressing pressure)
 - o High vacuum bonding atmosphere with approx. 1×10^{-6} mbar
 - o Temperature homogeneity up to ± 5 K
 - o Pressing force up to 4,000 kN
 - o Uniform force distribution
 - o Pressing dimension: up to 900 x 1,000 mm²
 - o Take-up path precision ≤ 0.1 mm
- **Short cycles:**
 - o Fast cooling device for short cycles
 - o Full automatic process control
 - o String pumping unit
- **Flexible System:**
 - o Stroke (force limited) and Force (stroke limited) control
 - o Reliable system design for long life span
 - o Universal application in high vacuum thermal treatment processes by easy removable pressing unit

Process Advantage of Diffusion Bonding

- Similar and dissimilar materials joints possible
- Joint properties similar to bulk material
- Highest strength of bonding interface
- Best corrosion resistance of bonding interface
- Optimum thermal stability of produced parts
- Uniform and repeatable process results
- Bonding of highly reactive materials (e.g. Ti, Nb, Zr)



Al-Heat-Exchanger

Application Examples

Molds and dies

Cooling Plates

Bonding of micro-reactors

Bonding of high temperature alloys
for aircraft industry

Parts design must provide an outer planar
surface and a homogeneous force transfer
over the complete bonding area



Micro-Heat-Exchanger



PVA TePla – The Company

As a vacuum specialist for high-temperature and plasma treatment processes, PVA TePla AG is one of the world's leading plant engineering companies. Its core competencies are in the fields of hard metal sintering and crystal growing as well as the use of plasma systems for surface activation and ultra-fine cleaning.

With its systems and services, PVA TePla enables and supports the innovative manufacturing processes and optical developments of its customers, primarily in the semiconductor, hard metal, electrical/electronic and optical industries - as well as the energy, photovoltaic and environmental technologies of tomorrow.

Industrial Systems – The Division

The Industrial Systems Division of PVA TePla specializes in the development, construction and marketing of thermal plants and systems for processing top-quality materials at high temperatures.

With almost 50 years experience from more than 1,000 systems supplied worldwide, testimonials from big names in the industry and a diversified range of process plants, the Industrial Systems Division of PVA TePla AG sets technological standards that have seen it grow to become a global market leader in the provision of vacuum sintering plant for hard metals in particular.

Vacuum Systems – The Products

The core competency of PVA TePla is to build resistance and inductively heated systems for vacuum and high temperature applications and heat treatment.

Especially graphite resistance heated vacuum (COV) and pressure (COD) systems for the universal application of dewaxing, vacuum sintering and the subsequent isostatic pressing of metals, carbides, alloys and ceramics are main products of the Industrial Systems Division.

Metallic heated high-vacuum heat treatment furnaces (MOV), designed for typical applications like vacuum brazing, degassing, sintering and cleaning are further successful products.

Inductively heated melting and casting systems (VSG) for melting of metals, alloys and special materials under high-vacuum, fine-vacuum or inert gas atmosphere and heat treatment furnaces (IOV) for sintering and carburising applications round up PVA TePla's product range of vacuum systems.

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