

The Solution



ALD Vacuum Technologies

High Tech is our Business

VKPgr

Vacuum Sintering Plant for Debinding,
Sintering and Overpressure Sintering



High tech is our Business

ALD is a brand name associated world-wide with innovative vacuum technology at the highest level. As one of the leading manufacturers of vacuum plants and vacuum process technology we supply all areas of vacuum metallurgy and vacuum heat treatment with high-tech products and services.

Tradition with obligation

The company's success story begins with two great entrepreneurs in vacuum technology: Ernst Leybold (1824 – 1907), founder of the Leybold company and Wilhelm Carl Heraeus (1827 – 1904), founder of the Heraeus company. The companies Leybold, Heraeus and De-



Wilhelm Carl Heraeus



Ernst Leybold

gussa, which was founded by Friedrich Ernst Roessler in 1837, are the roots of ALD. Today, ALD is a member of the international AMG Advanced Metallurgical Group N.V. and is ranked at the top in vacuum metallurgy. ALD is the leader in vacuum heat treatment technology.

Technology, setting examples

Thanks to our advanced and highly sophisticated concepts ALD offers individual solutions which are geared to their respective tasks. The technological advancements in vacuum metallurgy, vacuum heat treatment and vacuum sintering technology make us a strong partner for important and growing future-oriented branches such as energy production, aviation, material production and processing and the automotive industry. Our ambition to provide the highest level of quality and technical perfection is strengthened by our determination to supply our customers with optimum service. Therefore, we are continuously developing new ecological processes, which are further improved in specialized operating companies, thus conserving resources and protecting the environment.

Service, creating additional benefits

Through consistent project management and quality management ALD has acquired a top position in the international marketplace. In addition to our high level of expertise in process and plant technology we offer a wide range of extensive services together with our representatives and partners worldwide. Our full service comprises the excellent supply of spare parts, periodic maintenance as well as servicing, modernization and integration of newly developed processes into existing plants. You can be assured, ALD is your reliable partner, today, tomorrow and in the future.

Higher productivity

ALD Vacuum Technologies has developed and built sintering plants for hard metals, cermets and other PM-materials for more than 50 years. The use of the latest technologies results in the improved and lasting quality of the sintering products. Substantial savings in time lead to much higher productivity and improved costs.



Vacuum sintering under pressure

In powder metallurgy compact, fine grained semi-finished or finished parts are manufactured in a multi-stage process. Metal powder is mechanically compacted to green bodies using molding tools or molding presses. Heating in a protective atmosphere, at high pressure and high temperatures, yet still below the melting point of the main alloy, the powder particles sinter.

Reliable Technology

The vacuum sintering plant VKPgr is used for debinding, vacuum sintering and overpressure sintering of metals and alloys. The proven, highly flexible multi-dewaxing system comprises up to four different processes and can be customized optimally to meet individual requirements. ALD has developed a special heating system to obtain ultimate temperature uniformity for perfect sintering results.

Worldwide use

ALD Vacuum Technologies GmbH is recognized in the international market for their expertise in powder metallurgical technologies and know-how in building sintering furnaces. The modular components, easily accessible plant components, sturdy design, easy and time-saving installation of the heater and maintenance are only some advantages of the vacuum sintering plant ALD VKPgr.

Successfully in use:



VKPgr

Hardness which pays off

The technology of the vacuum sintering plant has delivered optimum performance for many years. Continuous improvement of processes allows reproducing the high sintering quality at any time. The results are improved material quality such as density, strength, durability and hardness of hard metals which meet highest demands.



The modular design principle

The vacuum sintering plant ALD VKPgr consists of modular components which provide easy access to all plant components. Each component group is subjected to the strictest quality control in every production state. Prior to shipment the plant is completely assembled and all functions are tested in detail. Therefore, assembly and commissioning at Buyer's site can be performed within a very short time.

Pressure vessel

- double-walled, water-cooled, horizontal, cylindrical pressure vessel, designed for a high number of load cycles/lifetime, for rated pressures of 6 (10) MPa
- two doors, each with one 3-piece quick acting hydraulic bayonet lock and electrically monitored blocking slides
- current lead through for external disassembly (without disassembly of the muffle and insulation cylinder)

Heating insert

- resistance heated furnace with 3 (4) independently controlled heating circuits in the 6 (10) MPa furnace version
- round muffle and heating insert with round pressure vessel for flexible and high density of the load
- bottom heating separately controlled for example for debinding of large parts

- high temperature uniformity through the symmetrical arrangement of the heating circuits (longitudinal and cross axis)
- hydraulically operated, low in maintenance, Graphite muffle and insulation doors, sealed by a spring system (also ensures sealing during thermal expansion/shrinking)
- long-life special hard felt insulation cylinder, low in maintenance because of plane insulation surfaces
- simple loading of the furnace by means of a Graphite roller track in the furnace
- very simple, time-saving assembly and maintenance of heating insert, many identical parts, minimum requirement for spare parts
- earth fault detectors for all heating circuits prevent "arcing"
- automatic recognition of wear on the graphite heaters (ALD-Patent EP 01101496)

Vacuum pump set consisting of one van pump and one roots blower, Pfeiffer Vacuum or Oerlikon Leybold (other types on request).

Multi-dewaxing system for up to four different debinding processes (optional):

- Argon-low-pressure dewaxing for paraffin (Δp)
- H₂-overpressure dewaxing for paraffin with burnoff

- H₂-overpressure debinding for PEG with burnoff
- H₂-low-pressure dewaxing for paraffin
- automated temperature control of condenser via process progress (ALD-Patent EP 1046448 A2)
- ramp evacuation function to prevent too fast evaporation of pressing aids

Application of process gases

- sinter-HIP with high pressure Argon gas
- sintering with process gases such as: Ar, H₂, N₂, CH₄, CO and others by means of mass flow controllers
- sinter gas feed directly into the muffle and onto the work pieces
- optional sinter gas feed via variable nozzle field in the muffle for direct control of the gas flow
- pressure control in the working space during debinding and sintering
- Argon partial pressure control prevents cobalt evaporation
- safety equipments for the use of flammable process gases.

Fast cooling unit

- new fast cooling unit, developed by ALD, with external high pressure cooling gas circuit with fan and big heat exchanger

Everything under control – the ALD VKPgr control system

The vacuum sintering plant, type ALD VKPgr is equipped with an easy to operate control system. All processes are monitored and documented. The PLC controls all movements and guarantees the reproducibility of the processes.

Electrical/electronic equipment

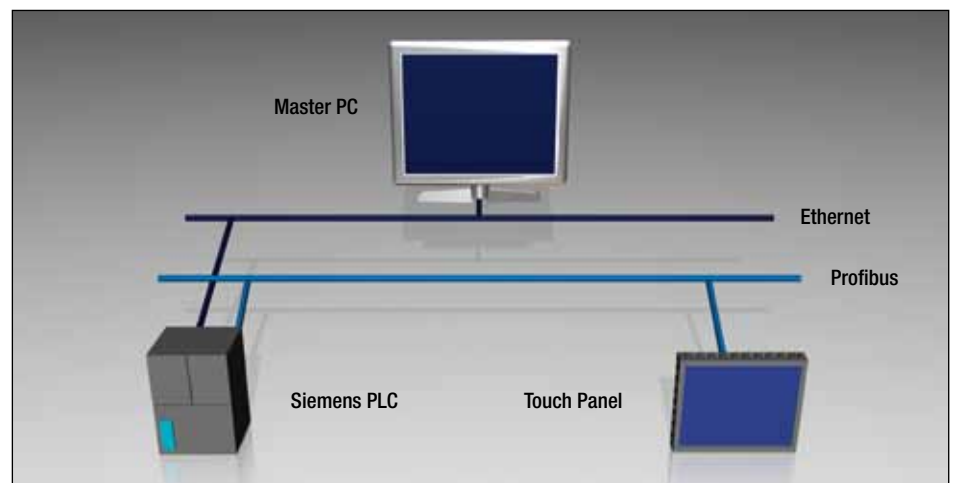
- Power package consisting of communicating single-phase thyristor power controller, high current transformer and water-cooled high current cables for each heating circuit
- Earth fault detectors for all heating circuits
- Thermo-electrical flow guards for all cooling water circuits
- Redundant interlocking system (PLC and relays) for all door functions and options for flammable gases
- Modem for PC/PLC for diagnostics via telecom system for maintenance and failure

Plant control

The Siemens PLC controls all processes in the vacuum sintering plant ALD VKPgr and as well as temperature, pressure and gas flow. A touch panel is installed into the control cabinet which allows a self-sufficient operation of the plant. A superior host computer creates the entire documentation based on which individual processes can be retraced.

Plant operation

The control of the vacuum sintering plant ALD VKPgr is designed for easy operation and high performance quality. The host computer creates a recipe and the batch management. Process relevant data can be selected and processed any time via switchable, multi-lingual PC user surface (German, English, French, Russian, Chinese and others), saving time and costs. This is an important contribution to quality control.



Service for twenty-four-seven operation

The customer's satisfaction is our highest priority. Therefore, we have set high quality standards for ourselves. In addition to technical expertise, reliability, flexibility and highest quality, ALD is offering high service availability, creating a real added value.



Your reliable partner

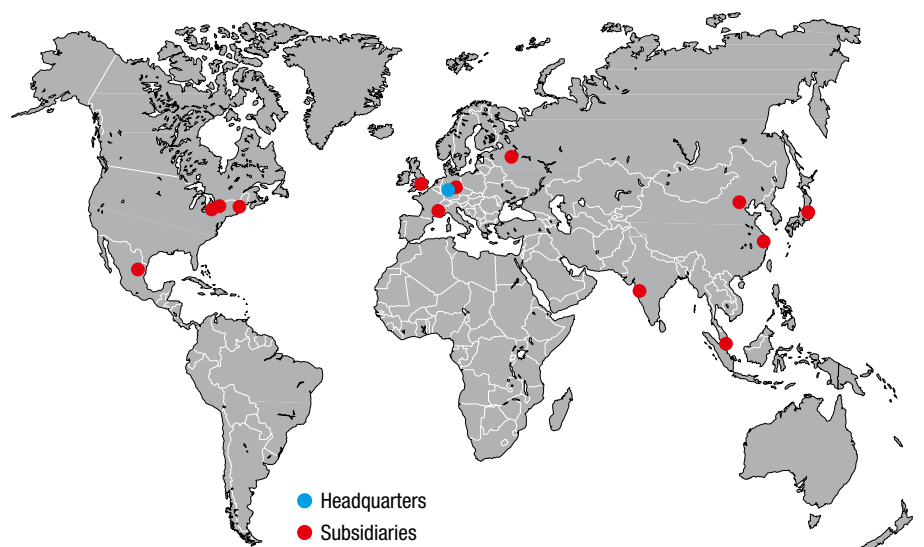
The vacuum sintering furnace ALD VKPgr is designed for a 24/7 operation. In order to guarantee smooth continuous operation, ALD has set up a world-wide network of experienced specialists who offer universal service for the entire process chain. Thus, in addition to repairs, installations, preventive maintenance, hotline assistance and remote services are performed in a highly professional manner. We have established warehouses at strategically favourable locations, which store original spare parts to reach each vacuum sintering furnace ALD VKPgr fast and reliably.

Our service overview

- supply of spare parts
- repair service
- service and inspections
- modernization of plants (factory installations)
- operator training
- preventive maintenance
- professional support in emergencies

Optional Accessories

- charge car for loading of the VKPgr
- closed cooling water recooling plant
- Argon gas supply and recycling system
- uninterruptable power supply
- Graphite charging plates



Advantages at one glance

Continuous improvement provides the means to customize the plant exactly to the Buyer's requirements. The results are reduced production costs, improved efficiency, increased productivity and environmental compatibility.



Environment

- low environmental contamination
- no CO₂ emission
- high energy efficiency due to low thermal loss
- on-demand plant operation
- easy-control electric heating
- cold wall technology, allowing immediate integration into production
- little noise emission
- clean working environment

Quality

- complete quality documentation for each individual charge
- high reproducibility through easy process control
- high sintering uniformity on the part and in the charge
- optimal material properties
- high temperature uniformity through symmetric arrangement of the heating circuits
- furnace designed for a long service life
- multi-dewaxer for up to 4 different debinding processes

Commercial efficiency

- rapid commissioning
- optional plant expansion
- flexible and high charge density
- high performance because of short treatment times
- high process flexibility
- easy maintenance, can generally be performed by own staff
- low thermal loss, energy management, energy monitoring
- very high availability
- 24/7 service
- high reliability
- modular concept for different furnace sizes
- small spare parts stock due to many same parts
- low consumption costs due to low gas consumption and efficient gas recycling

Technology at one glance

The different sizes and options can be fitted exactly to meet the requirements of any sintering process. Here you will find the most important technical data of the standard plants.

VKPgr 6 MPa / 10 MPa
Vacuum Sintering Plant for Debinding, Sintering and Overpressure Sintering

Installation size	Nominal charge dimension (mm)	Maximum working capacity (mm)	Rated temperature (°C)	Installed transformer capacity (kVA) (6 MPa / 10 MPa)	Cooling water consumption (m³/h) (6 MPa / 10 MPa)
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Standard installation sizes for charges of a length of 900 mm:

VKPgr 30/30/90	300 x 300 x 900	Ø 500 x 1165	1600	350 / 385	13 / 17
VKPgr 50/50/90	500 x 500 x 900	Ø 800 x 1165	1600	485 / 600	18 / 22
VKPgr 50/50/180	500 x 500 x 1800	Ø 800 x 2105	1600	590 / 740	26 / 30
VKPgr 50/50/270	500 x 500 x 2700	Ø 800 x 3005	1600	880 / 1140	35 / 39

Standard installation sizes for charges of a length of 750 mm:

VKPgr 50/50/150	500 x 500 x 1500	Ø 800 x 1765	1600	485 / 690	24 / 28
VKPgr 50/50/230	500 x 500 x 2300	Ø 800 x 2605	1600	740 / 940	31 / 35
VKPgr 50/50/300	500 x 500 x 3000	Ø 800 x 3305	1600	910 / 1140	39 / 43

additional sizes on request



Interested in more information?

We would be glad to provide details about efficiencies and various advantages of the vacuum sintering furnace ALD VKPgr and integration of this system into your production process. Please contact us!

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