

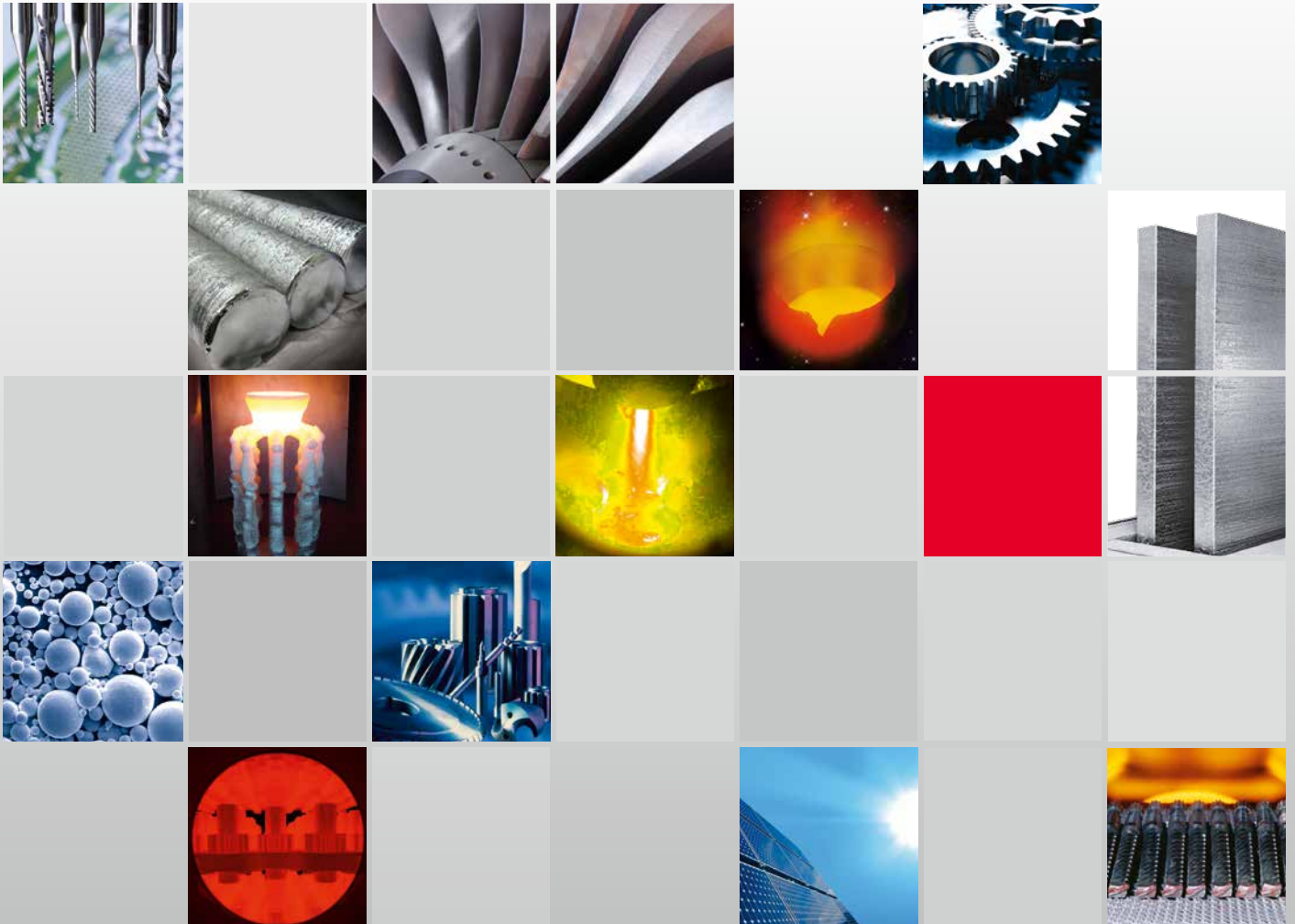


**ALD Vacuum Technologies**

High Tech is our Business

# Vacuum Systems and Technologies

for Metallurgy and Heat Treatment



# Worldwide Leading

## Our Market Position

ALD Vacuum Technologies is a market leader in vacuum systems and process services for thermal and thermo-chemical treatment of solid and molten metals.



### Our Process and Equipment Portfolio

Our engineering expertise includes

- vacuum process technology
- know-how to design customized system solutions for

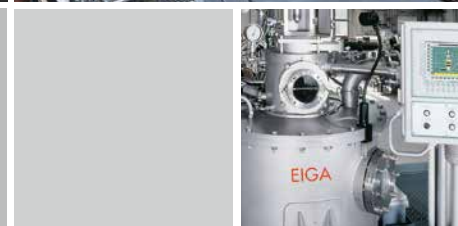
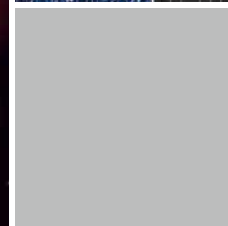
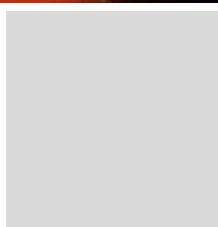
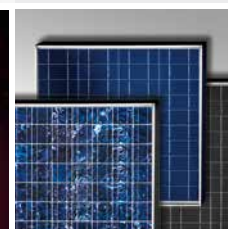
#### Vacuum Metallurgy

#### Vacuum Heat Treatment and Sintering

#### Nuclear Fuel Production and Waste Management

# Vacuum Metallurgy

Vacuum metallurgy involves vacuum processes for treating molten metals such as melting and remelting, casting and metal-powder technology as well as specialized vacuum coating technologies for high temperature turbine components.



## Applications

Examples of products that were developed using ALD's advanced vacuum processes include

- highly alloyed special steels and superalloys
- refractory and reactive metals with ultrahigh purity
- fine-grain precision castings with directional and single-crystal structures
- forgings with near net shape
- semiconductors for solar cells
- high purity powder for homogeneous and high strength parts
- additive manufacturing
- plasma spray coatings

## System Portfolio

ALD offers modern, efficiently functioning production systems which

- significantly contributes to the cost-effectiveness of a high quality production
- covers the complete range of sophisticated metal making processes like

## Primary Melting and Secondary Remelting

- Vacuum Induction Melting and Casting (VIM/VID/VIDP)
- Electro Slag Remelting (ESR)
- Vacuum Arc Remelting (VAR)
- Electron Beam Melting (EB-CHR)
- Plasma Melting (PAM-CHR)

## Casting and Coating

- Vacuum Induction Melting – Investment Casting (VIM-IC)
- Cold-Wall Induction Melting and Casting (LEICOMELT)
- VAR Skull Melting and Casting (VAR-SM)
- Vacuum Turbine Blade Coating (EB/PVD)

## Photovoltaic

- Solar silicon melting and Crystallization Unit (SCU)

## Powder Atomization

- Vacuum Induction Melting Gas Atomizer (VIGA)
- Electrode Induction Melting Gas Atomizer (EIGA)

## Special Furnaces

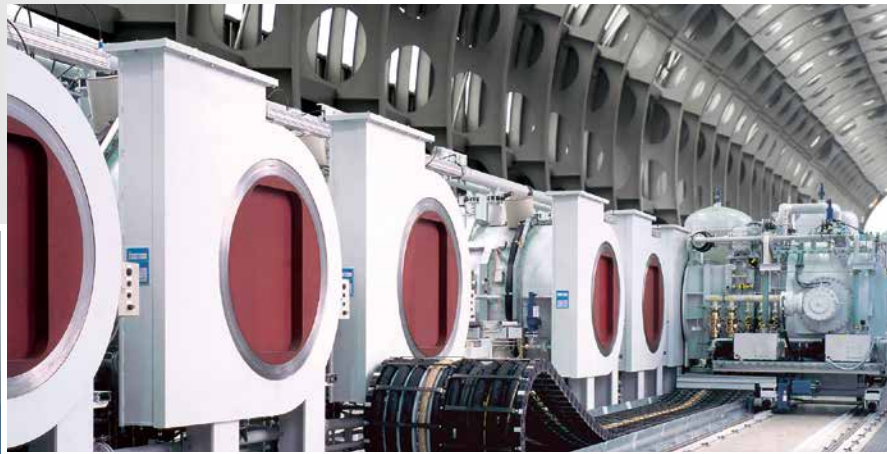
- Hot Isothermal Forging (HIF)
- Induction Heated Quartz Tube Furnace (IWQ)
- High Vacuum Resistance Furnace (WI)

## Turn-Key Solutions

## Research and Development

# Vacuum Heat Treatment and Sintering

Vacuum heat treatment processes of ALD are used whenever high performance properties are required for tools, transmissions, precision engine parts and fuel injection system components.



## Process and Furnace Portfolio

Vacuum hardening, tempering and brazing of

- tool steels and other metals, in vertical or horizontal batch furnaces

Vacuum carburizing and high pressure gas quenching furnaces from ALD

- MonoTherm® for aerospace applications
- DualTherm® for multi-purpose applications
- ModulTherm® for modular and flexible heat treatment in large scale-production
- SyncroTherm® for full integration in the manufacturing line

They all feature dry, high pressure gas quenching which

- saves subsequent cleaning steps
- reduces distortion of the quenched parts
- minimizes or eliminates costly hard surface machining

Vacuum sintering furnaces

- for sintering high-strength cemented carbides and special oxides
- for vacuum or high pressure (HIP) up to 100 bar

Vacuum nitriding furnaces

- for gas nitriding processes in NitroTherm® furnaces
- for active screen plasma nitriding (ASPN) processes using the ION<sub>2</sub>-cloud® technology

## Own & Operate

ALD's heat treatment centers offer heat treatment services for customers using furnace and process technology developed by ALD. This enables customers

- to minimize the learning curve, start-up costs and equipment investment
- to keep their manufacturing operations updated with the latest developments and technology

## Engineering Services

ALD's own competence center offers customized Development & Engineering Services

## Nuclear Fuel Production and Waste Management

ALD's modular pusher type sintering furnaces are used for the production of nuclear fuel pellets such as UO<sub>2</sub> and MOX. ALD also offer solutions for volume reduction, de-contamination and recycling contaminated metal scrap.

The company developed an Impermeable Graphite Matrix (IGM) as a method to embed contaminated radioactive graphite waste materials to ensure safe isolation from the biosphere for millions of years.



# Our Reputation

ALD's reputation is based on application of our extensive know-how and long-term investments in research and development, which have led to high-quality systems tailored to meet ever-increasing demands.



## Our Markets

Close cooperation and collaboration with well-known manufacturers have strengthened our capabilities as a supplier of key technologies to demanding high tech markets.

- High strength and at the same time long-term reliability are typical of demanding applications in the aviation, automotive and power generation industry.
- High purity products are needed for new developments in electronics, offshore and photovoltaic energy production.

## Our Expertise

New processes are being continuously developed that will yield improved quality, efficiency and the opportunity to produce entirely new materials. Each of these unique technologies offers different benefits, partially overlapping each other in their technical and economic potentials.

ALD has the experience and expertise to work in close cooperation with its customers to select and customize the appropriate process and equipment technology for their highly specialized applications.





## ALD Vacuum Technologies Worldwide

ALD Vacuum Technologies in Hanau, Germany, is the leading global supplier of process technologies, furnaces and services in the field of vacuum metallurgy and vacuum heat treatment. With subsidiaries in the USA, Japan, Russia, China, India, Mexico, France, Poland, Thailand and more than 20 representative offices, ALD is a worldwide supplier to industries e.g. power generation, environment, aviation, photovoltaic and automotive suppliers.



### ALD Vacuum Technologies GmbH

Otto-von-Guericke Platz 1  
63457 Hanau, Germany  
Phone +49 6181 307-0  
Fax +49 6181 307-3290  
E-Mail [info@ald-vt.de](mailto:info@ald-vt.de)  
Internet [www.ald-vt.de](http://www.ald-vt.de)

**You can find the addresses of all our sales partners and subsidiaries on [www.ald-vt.de](http://www.ald-vt.de).**