

**ALD Vacuum Technologies**  
High Tech is our Business



# DualTherm<sup>®</sup>

Double Chamber Vacuum Furnace  
for flexible heat treatment





## 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 furnaces 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 Degussa, founded by



Wilhelm Carl Heraeus Ernst Leybold

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 goal is to provide the highest level of quality and technical perfection which is strengthened by our determination to supply our customers with optimum service.

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 furnace 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 furnaces. You can be assured, ALD is your reliable partner, today, tomorrow and in the future.

# Universal application possibilities

ALD Vacuum Technologies is the technology leader in the field of case hardening in vacuum. ALD has developed the multi-purpose vacuum chamber furnace DualTherm® for small series and special applications. The ALD DualTherm® is available with the options: dry gas quench or oil quench.



## Vacuum heat treatment

In vacuum heat treatment the parts are heated in an oxygen-free environment, preventing damaging oxidation as would be the case in normal atmosphere. This technology is especially suited for hardening, tempering, case hardening, brazing, sintering and annealing in temperatures up to 1,250 °C.

## Multi-purpose vacuum chamber furnace

The multi-purpose chamber furnace ALD DualTherm® is the environmentally friendly alternative to the conventional atmospheric multipurpose chamber furnace. It offers the same variety of technical processes and part quality as a single chamber vacuum furnace. You can avoid the process and equipment disadvantages which can occur when the heating and quench chamber are combined.

## Production-integrated heat treatment furnace

The multi-purpose vacuum chamber furnace ALD DualTherm® can be directly integrated into mechanical production. Since the unit is a cold-wall furnace, its surroundings are neither influenced by heat nor by exhaust or other negative effects. This heat treatment technology has already established itself in the market worldwide, with full production integration and increased productivity.

Successfully in use:

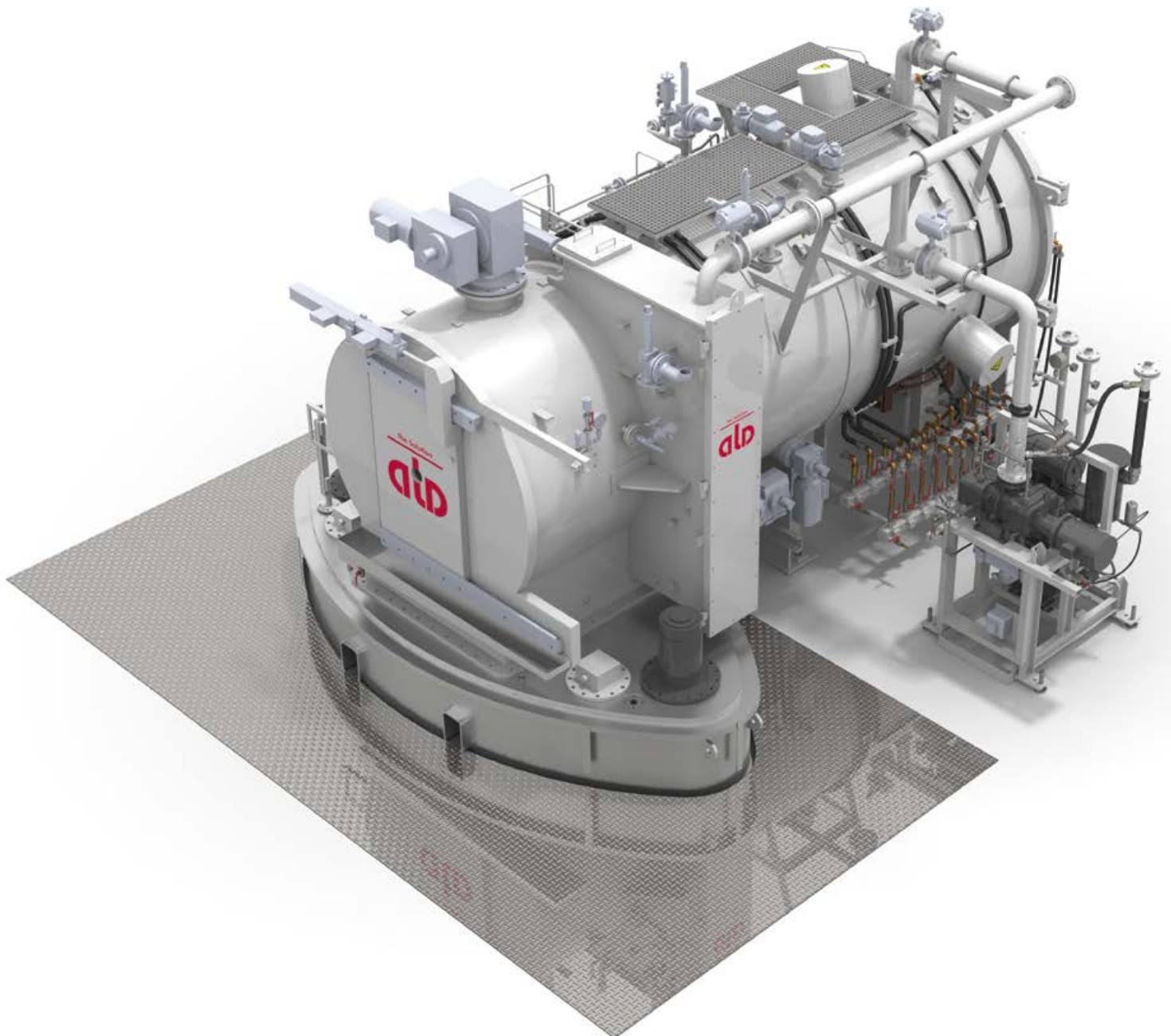


**DualTherm®**



## Inspiring flexibility

ALD has successfully applied the vacuum heat treatment technology for more than 40 years. The ALD DualTherm® furnace is the ideal multi-purpose vacuum chamber furnace for use in near-series production as well as in flexible production with alternating processes.



## The Furnace Concept

At the beginning of the process the quench chamber is used as a loading chamber by evacuating the air. Subsequently, the transport fork which is located in the cold area of the furnace transports the load into the treatment chamber. Upon completion of heat treatment the transport fork removes the load from the treatment chamber and transports it into the quench chamber.

## The Treatment Chamber

The treatment chamber is equipped with multi-layer insulation and all-round graphite heating. While operating, the chamber is always under temperature and vacuum, except during convective heating. As a result, the only energy required is to heat the load, substantially increasing the service life of the insulation and reducing consumption costs. The service door in the rear of the treatment chamber allows easy maintenance of the furnace.

## The Transport Module

A forklift system installed in a cold transport area between treatment chamber and quench chamber transports the loads within the ALD DualTherm® furnace. Drives, switches and sensors are installed outside of the furnace and therefore are not exposed to the process atmosphere.

## The Quench Chamber

The furnace is available in two quench options:

### High pressure gas quench

The parts are hardened with quench gases, for example nitrogen or helium, with up to 20 bar pressure and high flow velocity. In addition to the maximum quench process a gradual quench process can be performed during which the speed of the fan motors as well as the chamber pressure is regulated. Gas quench offers the best results with regard to part distortion. The high pressure gas quench leaves the parts metallurgically bright. Subsequent cleaning is not necessary.

### Oil quench

Especially low alloyed materials or bulky parts may require oil quench. The ALD DualTherm® furnace in combination with an oil quench bath offers process variety and allows low pressure carburization with subsequent oil quench. It is possible to use various quench oils for a quench process especially suited to the parts.

## The Processes

- Neutral hardening up to 1,200 °C
- Low pressure carburization up to 1,050 °C
- Low pressure carbonitriding
- Annealing under partial pressure up to 1,250 °C
- Vacuum brazing

## Optional Equipment

**Convective system** for uniform and rapid heating in the temperature range of up to 950 °C.

**Diffusion pump** for applications in high vacuum.

**Quench media** such as nitrogen, helium, argon or oil, for various applications.

**Dynamic quenching process** for particularly smooth gas quenching of parts which are highly susceptible to distortion.

**Reverse system** for high uniformity and good distortion control for parts weighing more than 1 kg as well as for multi-layer charges.

**Rapid gas cooling system** as an option in case of oil quench.



## All at one glance – the ALD DualTherm® Control Concept

The multi-purpose vacuum chamber furnace ALD DualTherm® is equipped with an easy-to-operate control system. It monitors and controls the heat treatment furnace as well as the documentation, service and maintenance.

### DualTherm® Control

The ALD multi-purpose vacuum chamber furnace is controlled by the DualTherm® Control (DTC). This database-driven PC system supports the following functions:

- plant operation
- operating modes of the plant
- recipe creation and management
- data back-up
- load record generation
- alarm management
- machine parameter management
- data transfer to external server
- automatic leakrate measurement

#### Optional:

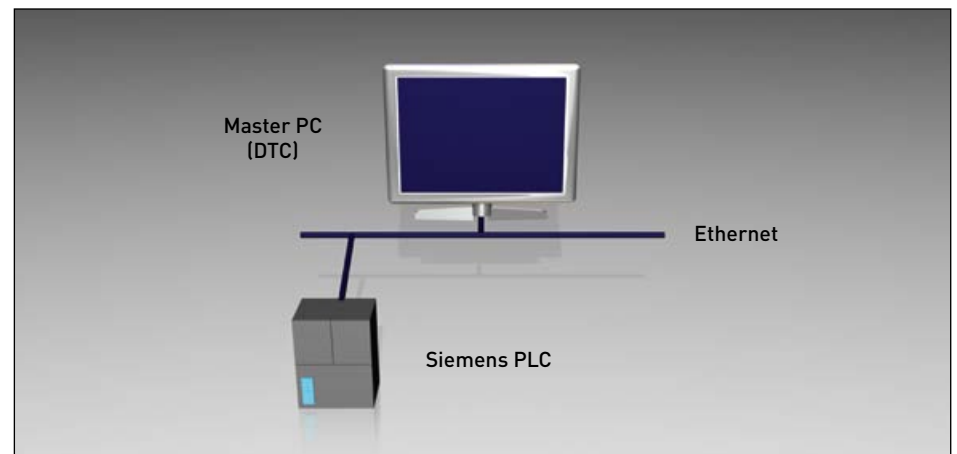
- entry of data via Scanner
- auto start-up of the furnace
- service management

### Plant control

The Siemens PLC manages all activities within the multi-purpose vacuum chamber furnace ALD DualTherm® and controls temperature, pressure and gas flow. The master PC manages all documentation and secures the traceability of individual processes.

### Plant operation

The control concept of the multi-purpose vacuum chamber furnace ALD DualTherm® is designed for high quality treatment and easy operation. Recipe creation and load management are performed from the master PC. Process relevant data can be accessed and edited at all times. This saves time, prevents costs and contributes to quality management.



## Service for twenty-four-seven operation

The customer's satisfaction is our highest priority. 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 multi-purpose vacuum chamber furnace ALD DualTherm® 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. 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 favorable locations, which store original spare parts to reach each multi-purpose vacuum chamber furnace ALD DualTherm® fast and reliably.

### Our service overview

- supply of spare parts and consumables
- repair service
- service and inspection
- modernization of plants
- operator training
- preventive maintenance
- professional support in emergencies

### Own & Operate

In the past decades, ALD has established long-term know-how in vacuum heat treatment which is applied in company-owned operating corporations. The ALD Own & Operate GmbH, located in Germany, USA and Mexico, for example, offers heat treatment services to the automotive and aviation industry as well as to other industries.



## Advantages at a glance

The multi-purpose vacuum chamber furnace ALD DualTherm® offers all possibilities to adjust the heat treatment furnace exactly to the customer's requirements. The results are reduced production costs, improved efficiency, increased productivity and environmental compatibility.



### Environment

- low environmental contamination
- no CO<sub>2</sub> emission
- high energy efficiency due to low thermal loss
- on-demand-plant operation
- easy-control electrical heating
- low noise emission
- dry quenching without disposal of waste washing water (gas quenching)

### Efficiency

- less hard machining due to minimal part distortion
- less maintenance
- high energy efficiency through on-demand technology
- low thermal loss through due to optimized insulation
- maximum availability
- high reliability
- quench media optimized for specific parts
- 24/7 on-site service

### Quality

- complete quality documentation for each load
- high reproducibility of part quality
- minimal part distortion
- little reworking of machined parts
- high temperature uniformity
- high carburizing uniformity on the part and within the load



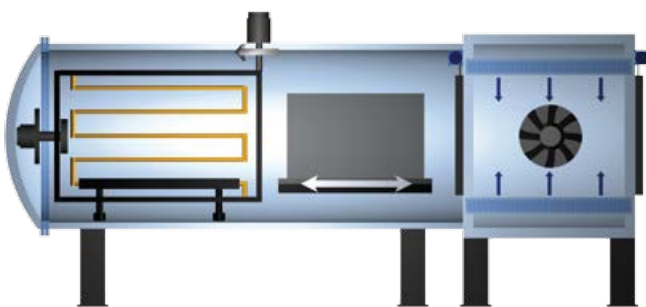


## Technology at one glance

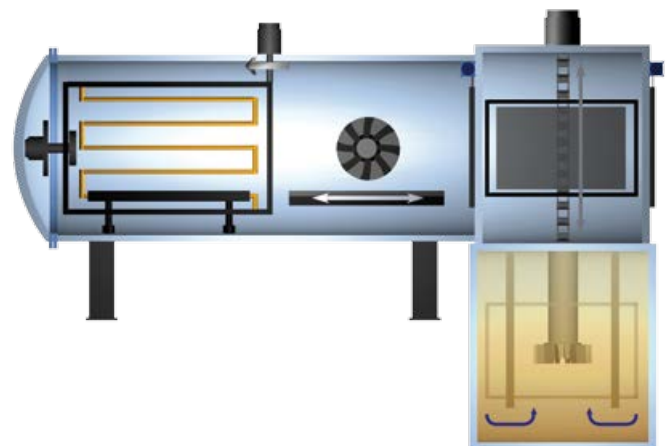
The multi-purpose vacuum chamber furnace ALD DualTherm® offers the flexible solution for our customers' heat treatment tasks.

charge dimensions (mm)			gross charge weight (kg)	quench gas options
width	height	length		
400	400	600	300	Oil, optional with gas cooling
600	750	1,000	standard 600 optional 1,000	N <sub>2</sub> / He / Ar max. 20 bar, Oil, optional with gas cooling
1,000	1,000	1,500	2,500	Oil, optional with gas cooling

Schematic view of DualTherm® with gas quenching



Schematic view of DualTherm® with oil quenching



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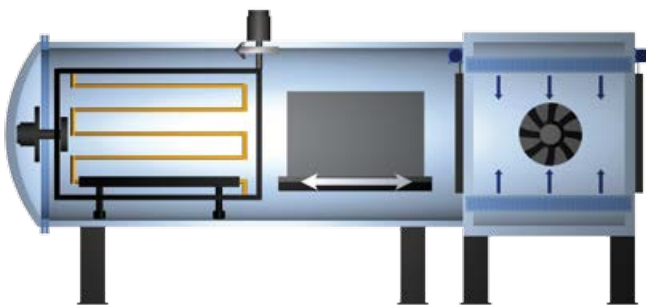


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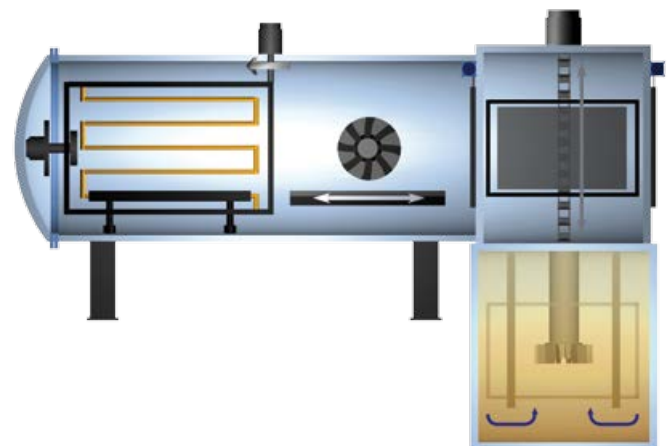
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Schematic view of DualTherm® with gas quenching



Schematic view of DualTherm® with oil quenching





## Interested in more information?

We would be glad to provide more details about efficiencies and various advantages of the multi-purpose vacuum chamber furnace ALD DualTherm® and integration of this system into your production process. Please contact us!

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