

ALD-Holcroft Vacuum Technologies

Providing Profitability Through Technology

A photograph of a large industrial facility with a curved, ribbed ceiling. In the foreground, a row of white industrial ovens with red circular openings is visible. A conveyor belt system is running through the ovens. The background shows more of the facility's structure and equipment.

ModulTherm[®] 2.0

Automated vacuum
heat treatment systems

New technologies for advancement

ALD-Holcroft provides the leading technology in vacuum case hardening. Low pressure carburizing with high pressure gas or vacuum oil quenching capabilities combine to define the new generation of ModulTherm® 2.0 heat treatment systems. This represents the preferred technology in the heat treatment of new transmissions and injection systems throughout the world.

Linked Single Chamber System

The ModulTherm heat treatment system consists of several individual treatment chambers which are positioned in row(s) and handled by a shuttle module which moves on rails. The shuttle module consists of a transport chamber, linked to either a high pressure gas quench chamber or a vacuum heated holding chamber. In the high pressure gas quench chamber loads are hardened in gas flow, at high pressure and high velocity, at the conclusion of its thermal cycle. In the heated, vacuum holding chamber, workload temperatures are maintained, in vacuum, while shuttled to the appropriate quench (HPGQ or Oil Quench).

Heat Treatment Systems, integrated into production

The ModulTherm heat treatment system can be integrated directly into the mechanical production line. The system environment is not affected by heat or exhaust gases or any other negative effects, due to the cold wall furnace technology. The integration of heat treatment into the production line verifiably increases productivity. Many well-known manufacturers are already using the new heat treatment technology successfully for hardening, tempering, case hardening, brazing, sintering and annealing at temperatures up to 2282°F (1250°C).

Heat Treatment Chamber

Thermal and thermochemical heat treatment processes take place in individual treatment chambers which operate separately, and can perform simultaneously. Depending on the production situation, each single treatment chamber can be shut down at any time, thus ensuring the highest process flexibility, increasing the utilization level, conserving energy and reducing cost.

The separation of the transport and quench functions allows loading of treatment chambers while the quench cycle is in process. This increases the degree of capital utilization and improves overall efficiency.

Quench Shuttle Module

The shuttle module rides on permanently mounted floor tracks effectively linking all aspects of the ModulTherm system through one shuttle. It is offered in two different configurations: High Pressure Gas Quench and Heated, Vacuum. These configurations each include a transport chamber and the configuration choice enables the greatest flexibility when planning for a ModulTherm system.

Vacuum Heated Shuttle Module

The vacuum heated shuttle module provides means to transport workloads from any vacuum thermal treatment chamber to any quench module. This module makes possible the inclusion of all types of quench modules within the system. High Pressure Gas Quench, Vacuum Oil Quench, even water quench or press quenching can be accommodated by the vacuum heated shuttle. This flexibility provides the most versatility in configuring a system. The vacuum heated shuttle is capable of maintaining load temperature, under vacuum, while transporting the workloads to their respective quench. This insures that "time to quench" is always a constant. This shuttle is capable of rotating to service loads to and from both sides of the system's main rail.

Transport Chamber

The transport chamber is firmly attached to the shuttle module. An internal fork-lift system transports hot and cold workloads within the ModulTherm 2.0 system. The transport chamber contains no graphite components allowing operation from atmosphere to vacuum, with both hot and cold workloads. All fork-lift drive motors and sensors are mounted outside of the transport chamber for easy maintenance access, away from the radiant heat of the workloads and the vacuum environment.

High Pressure Gas Quench

ALD-Holcroft offers High Pressure Gas Quenching capabilities in two different configurations: 1) As an integral part of the Quench Shuttle Module, otherwise known as the Moving Quench; and 2) Stationary, mounted permanently to the floor and serviced by the vacuum heated shuttle module. The quenching process is identical; meaning quench recipes will give the exact results in either configuration. The High Pressure Gas Quench is perfectly capable of transforming low alloyed case hardening and heat-treatable steels. The parts are hardened homogeneously and safely in a specially developed quench chamber, using quench gases such as nitrogen or helium under high pressure, of

up to 20 bar, and at high velocity. The advantages of our patented gas quench technology include minimum dispersion of hardness values and minimum distortion. For bigger parts, low distortion is obtained by quench gas reversal. i.e. by alternating the quench gas flow through the load from top-to-bottom and vice versa. Dynamic quenching allows treatment of especially thin-walled parts with minimum distortion, often making expensive subsequent operations of straightening, grinding or machining unnecessary.

Vacuum Oil Quench

Vacuum Oil Quench capabilities ensure bright clean parts and full metallurgical transformation of very low alloyed case hardening and heat-treatable steels. The Vacuum Oil Quench employs high volume pumping technology with adjustably homogenous flows to assure uniform transformation throughout the load. Quench severity is adjustable by temperature and variable oil flow speeds with all parameters recipe selectable. One distinct advantage of the Vacuum Oil Quench is there is no need for a floor pit. Oil Quenching, which comprises about 90% of all case hardening needs, often is preferred for larger parts requiring deep case hardening. Once quenched, oil coated workloads are prevented from re-entering the vacuum environment, ensuring good vacuum integrity and a clean environment for future loads.

New technology successfully in use:



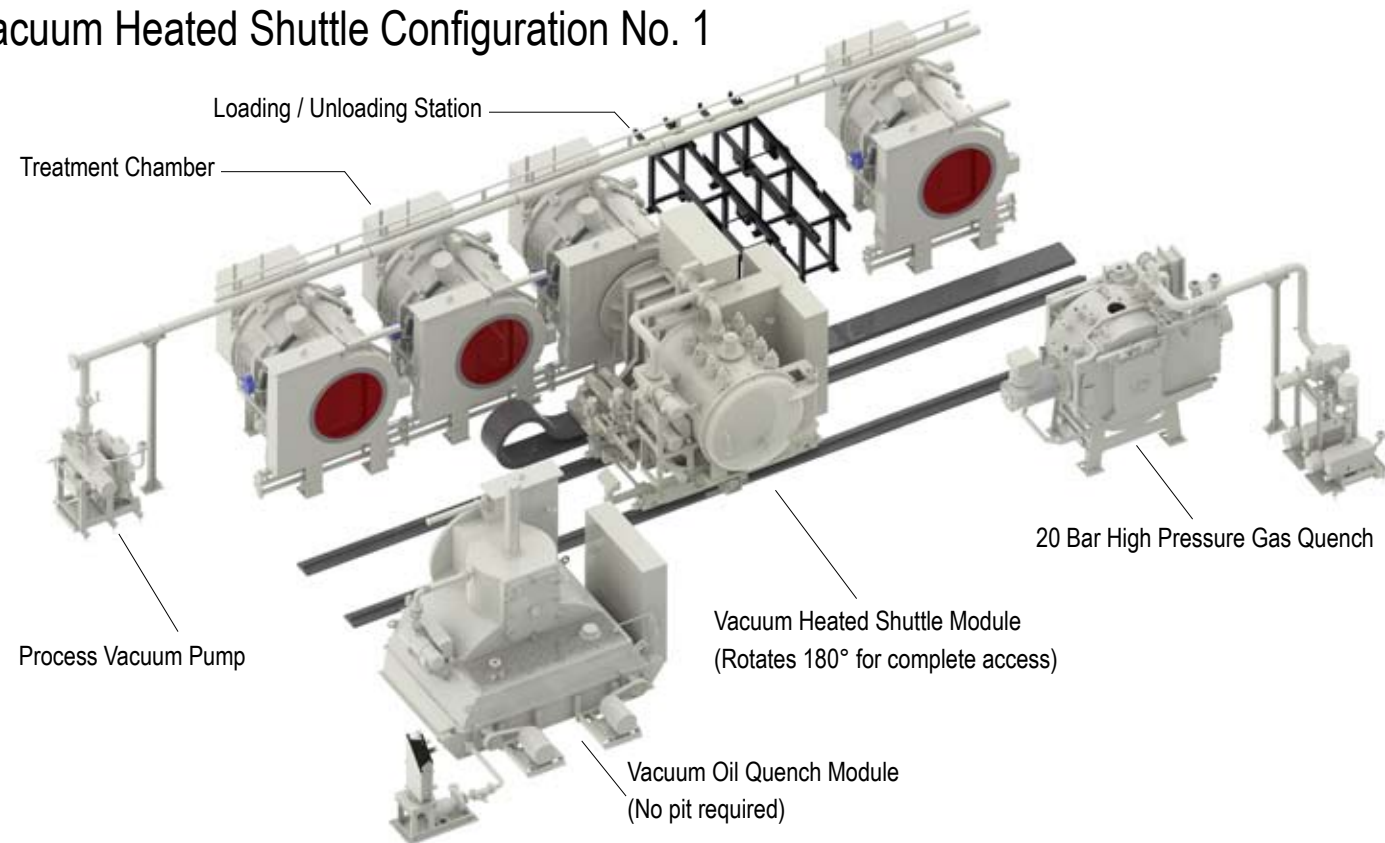
Two configurations of high pressure gas quenching

Quench recipes in one configuration will give the exact results in the other configuration: 1) As an integral part of the Quench Shuttle Module, otherwise known as the Moving Quench; and 2) Stationary, mounted permanently to the floor and serviced by the Vacuum Heated Shuttle Module.

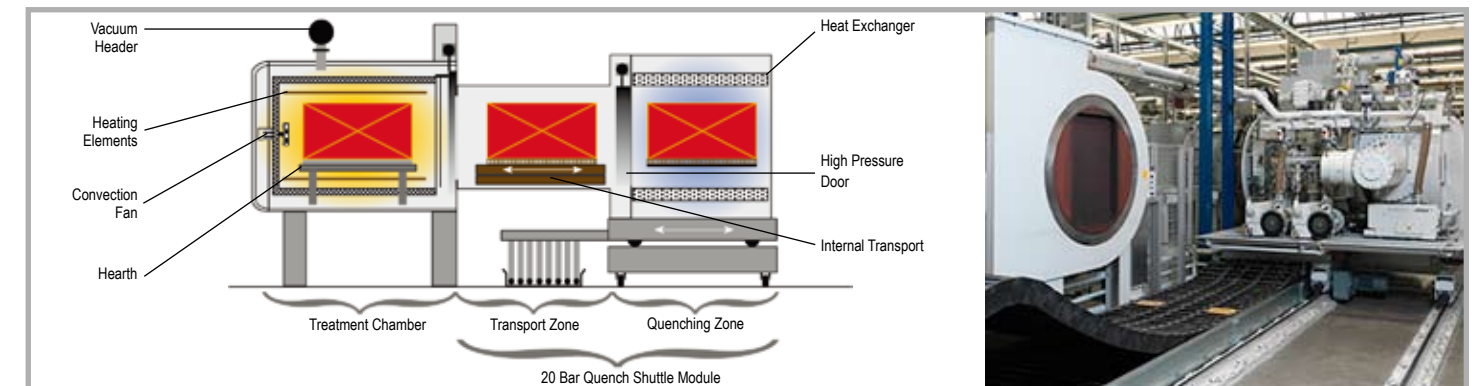
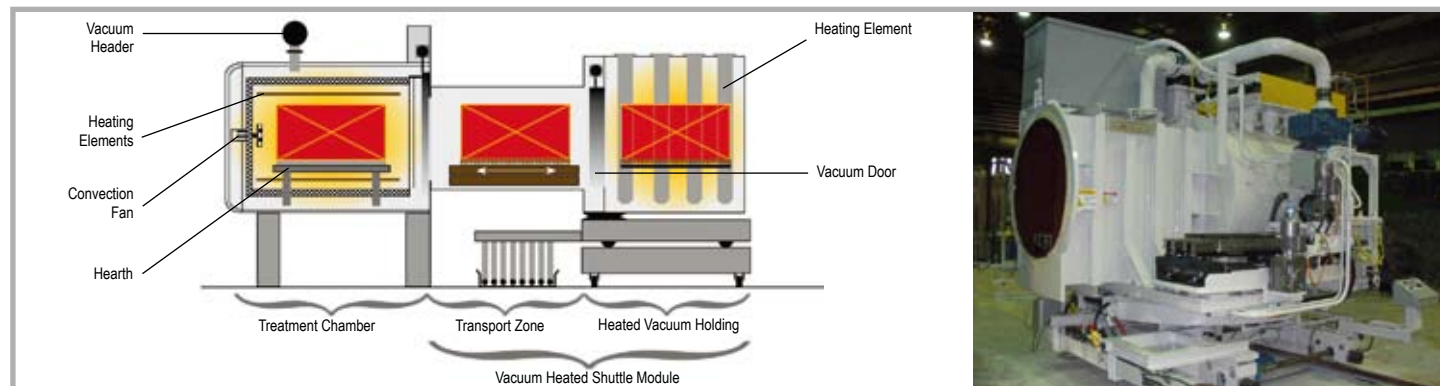
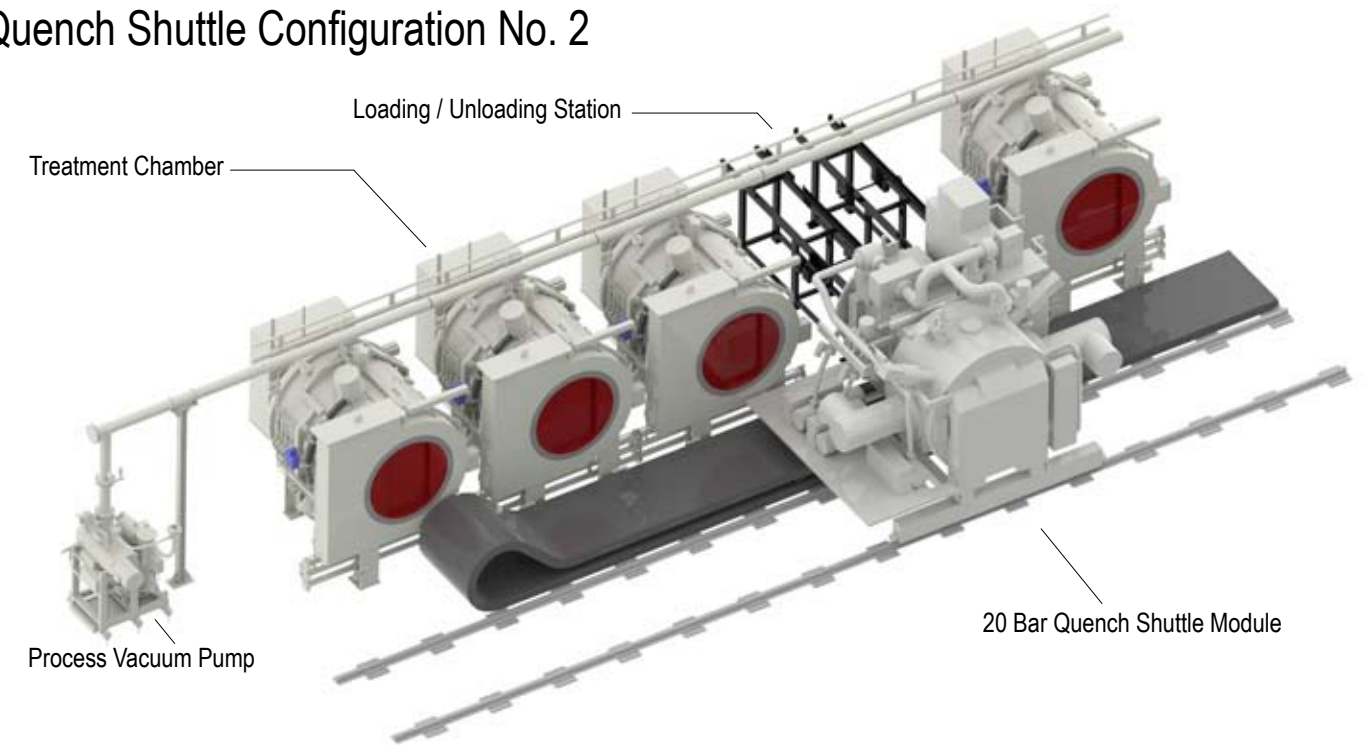
Charge dimensions for configuration no. 1 and 2

Charge dimension	Size A	Size B	Size C	Gross charge weight	
				Size A	Size A, Option
Width	24" / 600 mm	36" / 1000 mm	36" / 1000 mm	1100 lb / 500 kg	2200 lb / 1000 kg
Height	30" / 750 mm	36" / 1000 mm	36" / 1000 mm	Size B	3500 lb / 1600 kg
Length	36" / 1000 mm	48" / 1200 mm	72" / 1800 mm	Size C	7000 lb / 3175 kg

Vacuum Heated Shuttle Configuration No. 1



Quench Shuttle Configuration No. 2



Everything under control –

The ModulTherm heat treatment system is equipped with an easy to operate control system. In addition to the control of the heat treatment system it manages documentation, service and maintenance.



ModulTherm Control

The entire ModulTherm system is controlled by the ModulTherm Control (MDC). The database hosted by a standard industrial PC supports the following functions:

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

optional:

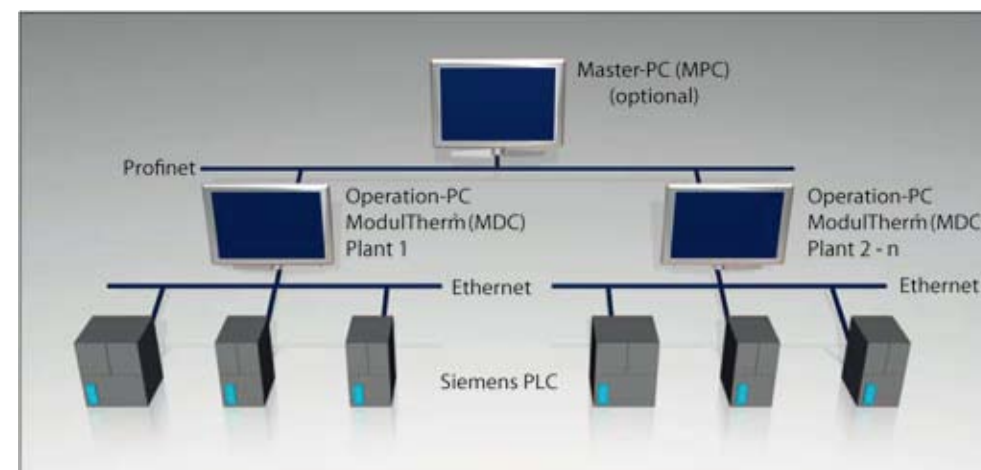
- second furnace PC (multi-user function)
- data input via scanner
- automated system power-on
- maintenance management
- automatic leak rate determination
- buffer management

Plant Control

The Siemens PLC controls all movements and process parameters within the ModulTherm system, i.e. temperature, pressure and gas flow control in each treatment chamber. In addition to the master control, each of the system's modules and peripheral systems is equipped with their own PLC control.

Control System

Several ModulTherm heat treatment systems can operate simultaneously in the production line. As an option, these systems can be linked to the network of the superior control system. The central master PC (MPC) visualizes all connected systems. Recipe creation and management as well as batch management in the loading and unloading stations of each connected plant can be carried out easily.



Environment

- low environmental contamination
- no CO₂ emission
- high energy efficiency due to low thermal losses
- on-demand plant operation
- easy-control electric heating
- cold wall technology, allowing immediate integration into production
- low noise emission (<75 dB)
- high pressure gas quench eliminates the need for disposal of washing waste water
- clean working environment without oil, vapors or flames

Quality

- zero intergranular oxidation (IGO)
- high reproducibility by easy process control
- high carburizing uniformity between part-to-part and load-to-load
- superior metallurgy by virtue of uniform case depth–high strength and fatigue resistance
- clean and shiny part surfaces
- minimal part distortion
- little to no subsequent processing
- complete quality documentation for each load

Commercial Efficiency

- investment into a system which meets the customer's requirements exactly
- flexible and simple system expansion without production interruption
- efficient component utilization
- high throughput due to short treatment cycles
- high production flexibility through simultaneous processes
- less hard machining due to minimal part distortion
- easy maintenance without production interruption
- low consumption cost due to small gas volumes and efficient quench gas recovery
- high energy efficiency through on-demand-technology, less thermal losses, energy-efficient drives, intelligent energy management
- maximum availability
- economical treatment of small, medium and large scale production

Advantages at a glance

The high production and process flexibility are creating new ways to individually adapt production to the respective demands. The results are reduced production costs, improved efficiency, increased productivity and environmental compatibility.

Our Service Overview

Service repairs, installations, preventive maintenance 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 ModulTherm system fast and reliably.

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

Your Reliable Partner

The ModulTherm system is designed for 24/7 operation. In order to guarantee smooth continuous operation, ALD-Holcroft is part of a world-wide network of experienced specialists who offer universal service for the entire process chain.

ModulTherm® is a registered trademark of ALD Vacuum Technologies GmbH

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