

SECO/WARWICK



VACUUM FURNACES IN HEAT TREATMENT SYSTEMS

MISSION

The mission tells us why we exist, for whom we do what we do, why we do it, and what the purpose of the company's existence is.

Thanks to the experience and expertise of our employees as well as cooperation with business partners, we create innovative products that give our customers reliable, safe, and environmentally friendly heat treatment and metallurgy solutions ensuring the economic efficiency of their business.

VISION

The vision is our dream, inspiration, encouragement, stimulus, signpost.

We want to be the first-choice provider of heat treatment and metallurgy solutions. Innovation and reliability are evident in the way we think and create anywhere in the world.

SECOLOGY

The **ECO** prefix is inscribed in our name and the Group's DNA. We do not talk and do not think differently about ecology other than Secology, because we look at environmental protection so broadly.

Secology is therefore a set of projects and ecological social initiatives, ecological investments within the company and the green technologies that we use or create.

Secology, thus, is not a new science or strategy, it is the SECO/WARWICK Group's attitude visible in various aspects of its operation.

For over 100 years, the SECO/WARWICK Group has been building the global heat treatment and metallurgy industry by providing industrial furnaces for leading companies in the following sectors: aviation, automotive, machinery, medical, toolmaking, power, and commercial heat treatment.

The company specializes in end-to-end solutions in 5 categories: vacuum heat treatment, aluminum thermal processing, atmosphere thermal processing, brazing of heat exchangers, and vacuum metallurgy.

Our solutions help to produce control system components, gears, aircraft landing systems, turbines, aircraft engine blades, plane and car heat exchangers, surgical instruments, and coins, as just a few examples of heat treatment and metallurgy applications.

DISCOVER OUR VACUUM HEAT TREATMENT SOLUTIONS.

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VACUUM FURNACES

– GENERAL INFORMATION

Vacuum furnaces use vacuum (vacuum created by air evacuation) as the protective atmosphere for the heat treated part surfaces. The vacuum furnace's main advantage is their versatility and the ability to carry out processes traditionally carried out in atmospheric furnaces. Differences in the vacuum furnace construction as well as the method of conducting the processes minimizes both media consumption and emissions to the environment, making the vacuum furnace itself a SECO/**ECO** solution when compared to traditional atmosphere furnaces.

VACUUM HEAT TREATMENT'S **ECO-FRIENDLY FEATURES INCLUDE:**

- / Perfect part surface quality (without additional operations).
- / No intercrystalline oxidation (no additional mechanical treatment).
- / No need to use protective gases (lower costs and emissions).
- / Minimal consumption of process gases (cost savings) / minimum time for atmosphere preparation and conditioning (saving time and costs).
- / Zero startup and shutdown time, work on demand (saving time, costs).
- / No open flame, no risk of fire or explosion (safety).
- / Clean process, no part washing required (reduced environmental pollution) / low heat and by-product emissions (limited global warming effect).
- / Environmentally friendly (zero pollution).
- / Zero CO₂ emissions (carbon footprint reduction).

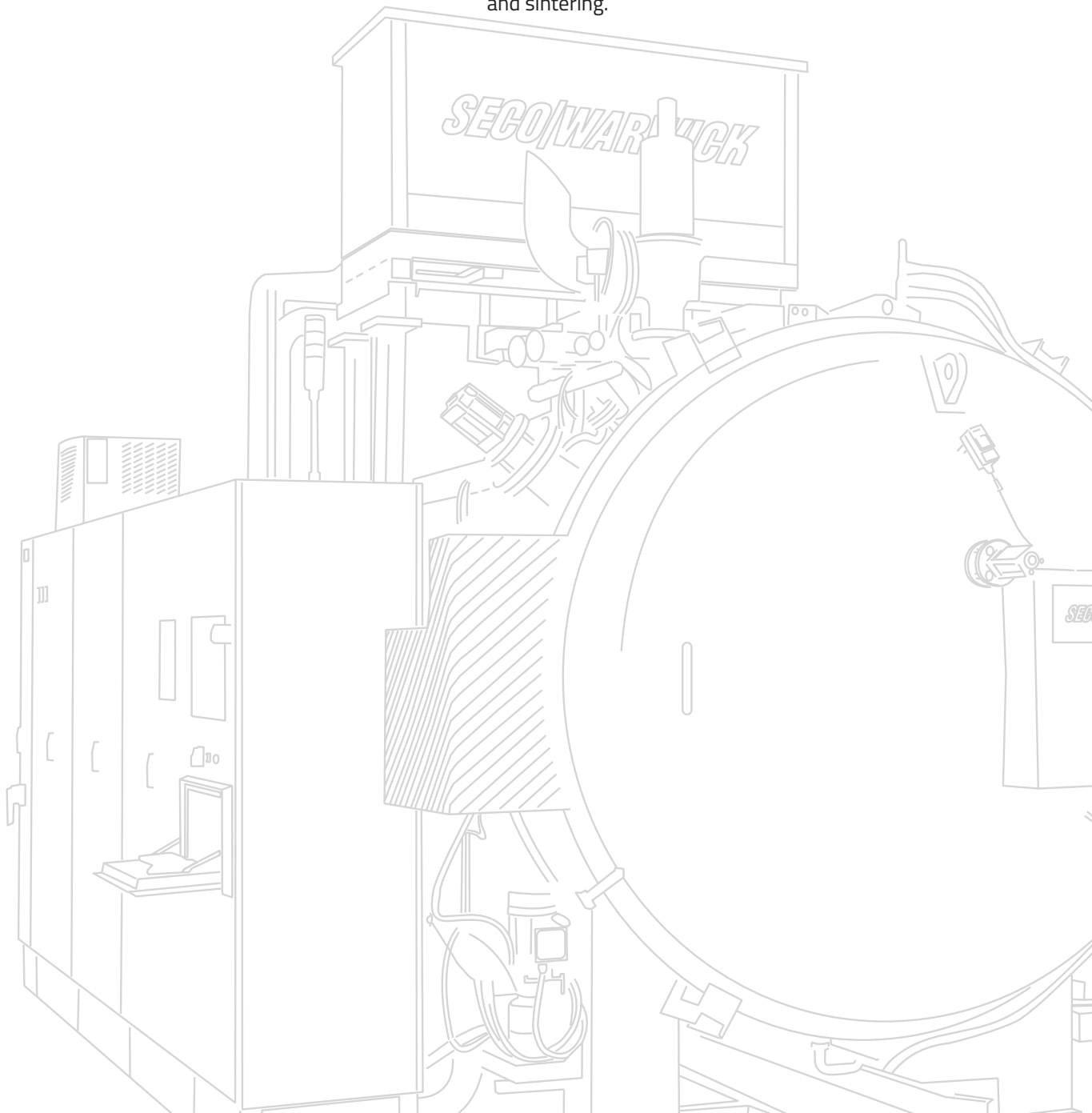
VECTOR

Single chamber vacuum furnace – Vector for heat treatment, hardening, tempering, annealing, brazing, low pressure carburizing (LPC) and sintering.

Vector is a single-chamber vacuum furnace that can be used for a wide variety of heat treating processes and applications, such like hardening, tempering, annealing, brazing, low pressure carburizing and sintering.

Vector provides important capabilities for producing high-uniformity in heat-treated parts, high consistency in workloads, and high speeds in batch processing with low consumption of power and process gases.

Vector high-pressure gas quench furnaces are the ideal solution for heat treating. Vector is a vacuum furnace with a round graphite hot zone. These furnaces can be used for most standard hardening, tempering, annealing, solution heat treating, brazing, and sintering.



VECTOR HV

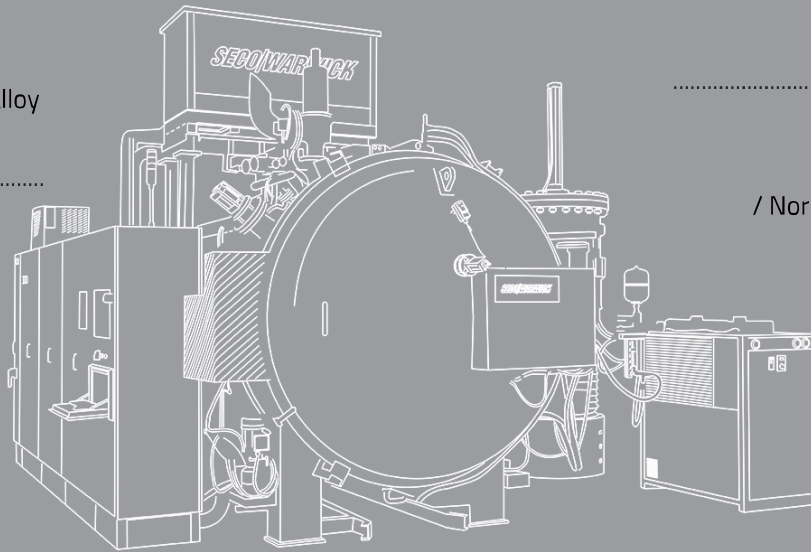
VACUUM FURNACE WITH HIGH VACUUM
FOR MULTIPURPOSE AND DEDICATED APPLICATIONS

MATERIALS

- / Alloyed steels
- / Stainless steels
- / Alloys and super alloys
- / Titanium and titanium alloy
- / Tool steels
- / HSLA

INDUSTRIES

- / Aviation,
- / Automotive,
- / Machine,
- / Tool,
- / Energy,
- / Medical,
- / Nuclear,
- / Electronic,
- / Metallurgy,
- / Commercial heat treatment,
- / Specialty Application



PROCESSES

- / Brazing
- / Annealing
- / Normalizing Homogenizing
- / Stress relief
- / Solution heat treating
- / Aging
- / Quenching
- / Diffusion bonding
- / Outgassing
- / Sintering
- / Tempering
- / Special

VECTOR HV provides important capabilities for producing high uniformity in heat-treated parts, high process cleanliness, high consistency in workloads, and efficient processing with low consumption of power and process gases.

FEATURES

- / Standard horizontal capacity from 200 to 3,000 kg and more
- / Standard vertical capacity: 1,500 kg (3,300 lbs) and 2,500 kg
- / Operational temperature – 1450°C / 2640°F
- / Temperature uniformity +/-6°C / +/-10°F
- / Uniform and efficient radiation heating 360°
- / Partial pressure control
- / High vacuum processing up to 10⁻⁸ mbar
- / Cooling gases: N₂, Ar, He up to 15bar
- / Controlled, forced convection cooling
- / Computer control system (PLC+IPC), operator-friendly
- / NADCAP and AMS specifications readiness
- / Global industrial standard compatible

ADVANTAGES

- / Wide range of heat treatment processes and applications
- / High-speeded cycles with high vacuum
- / High quality and ideal parts surface protection
- / Low consumption of energy, process gases and other utilities
- / Environmentally friendly with low emissions of process gases
- / Simple design, modular, fitted and adjusted to tasks and plant conditions
- / Guaranteed quality and repeatable process results
- / Predictive maintenance support
- / Remote control and monitoring
- / Fast delivery and simple installation
- / Customizable

VECTOR HPGQ

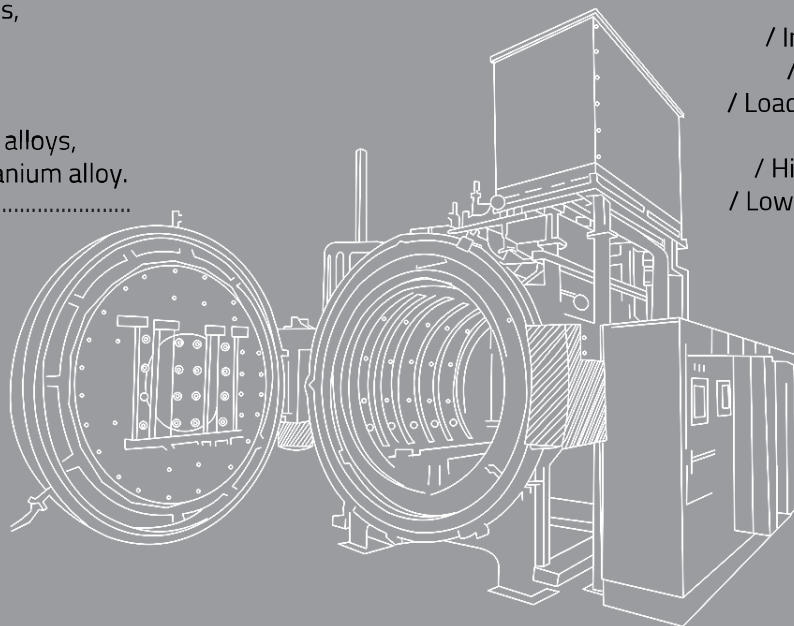
VACUUM FURNACE WITH HIGH PRESSURE GAS QUENCHING

MATERIALS

- / Tool steels,
- / Carburizing steels,
- / HSLA,
- / Alloyed steels,
- / Stainless steels,
- / Alloys and super alloys,
- / Titanium and titanium alloy.

INDUSTRIES

- / Aviation,
- / Automotive,
- / Machine,
- / Tool,
- / Energy,
- / Medical,
- / Nuclear,
- / Electronic,
- / Metallurgy,
- / Commercial heat treatment,
- / Specialty Application



DESIGN

- / Vertical orientation
- / Graphite or metal hot zone
- / Improved temperature uniformity
- / Multi-zone temperature control
- / Load thermocouples port and control
- / High-temperature operation
- / High vacuum or ultra-high vacuum
- / Low and cryogenic-temperature trap
- / Partial pressure control
- / Cooling gas flow direction

PROCESSES

- / Annealing,
- / Sintering,
- / Tempering
- / Brazing,
- / Hardening,
- / Low pressure carburizing & nitriding (LPC & LPN),
- / Solution heat treating.

VECTOR HPGQ provides important capabilities for producing high-uniformity in heat treated parts, high consistency in workloads, and high speeds in batch processing with low consumption of power and process gases

ADVANTAGES

- / Wide range of heat treatment processes and applications
- / High-speed cycles with high-pressure gas quench
- / Low consumption of energy, process gases, and other utilities
- / Environmentally friendly with low emissions of process gases
- / Simple design, modular, fitted and adjusted to tasks and plant conditions
- / Guaranteed quality and repeatable process results
- / Predictive maintenance
- / Remote control and monitoring
- / Fast delivery and simple installation
- / Customizable

FEATURES

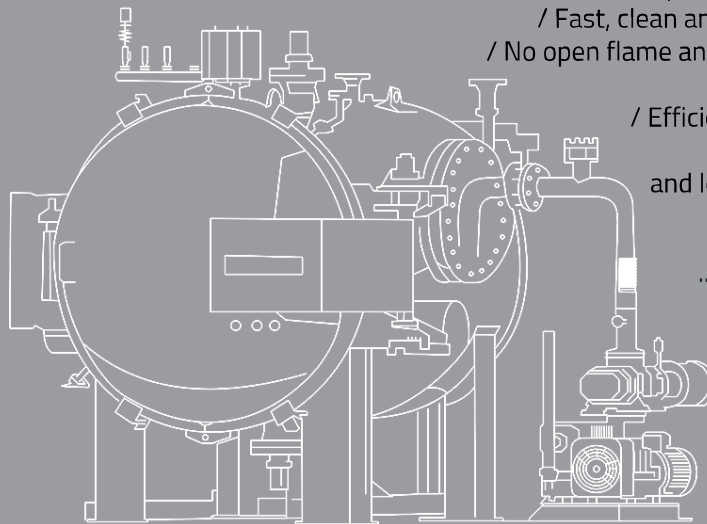
- / Standard horizontal capacity from 200 to 2,500 kg
- / Standard vertical capacity: 1,500 kg and 2,000 kg
- / Graphite or metal hot zone with a maximum vacuum of 10⁻² to 10⁻⁵/10⁻⁶ mbar
- / Quenching pressure: from 2 up to 25 bar
- / Quenching gases: N₂, Ar, He, H₂
- / ConFlap™ system supporting convection heating
- / FineCarb® / PreNitLPC® and vacuum nitriding LPN
- / A computer control system, operator-friendly
- / AMS2750 specification readiness

VECTOR 3D

VACUUM FURNACE FOR METALS HEAT TREATMENT AFTER ADDITIVE MANUFACTURING

ADVANTAGES

- / Compact design making it possible to install the furnace in small rooms
- / Comprehensive design enabling commissioning of the furnace once the media are connected
- / Complete tracing of the process with the PLC/IPC system
- / Quick cooling that accelerates the process time
- / Minimum process gas consumption
- / Fast, clean and economical process
- / No open flame and no flammable gases
- / High vacuum level
- / Efficient debinding system
= cleaner process
and longer furnace lifetime



INDUSTRIES

- / Aviation
- / Automotive
- / Medical
- / Prototyping
- / it can be used anywhere
where metal parts are produced.

PROCESSES

- / Debinding
- / Sintering
- / Stress relieving
- / Aging
- / Annealing

VECTOR 3D Range of heat treatment furnaces specially designed for the 3D printing technology.

GENERAL

Binder Jetting technology is putting a lot of attention to debinding systems as well as to perfecting process parameters in particular in terms of temperature uniformity. Both aspects have key influence on final piece quality and performance.

Laser sintering technology enables printing items made of materials such as alloy steels, aluminium and titanium. Heat treatment of such details requires oxygen-free environment. Thus, parameters such as leak rate and vacuum level are a key for SECO/WARWICK additive manufacturing furnaces.

These are the key parameters that help to achieve the required molecular structure and pureness level of parts. Heat treatment process performed in controlled furnace conditions helps to achieve required parameters of printed pieces.

Highly demanding sectors like aerospace, medical or automotive have specific needs in this area and furnace needs to satisfy them

ZeroFlow

GAS NITRIDING TECHNOLOGY

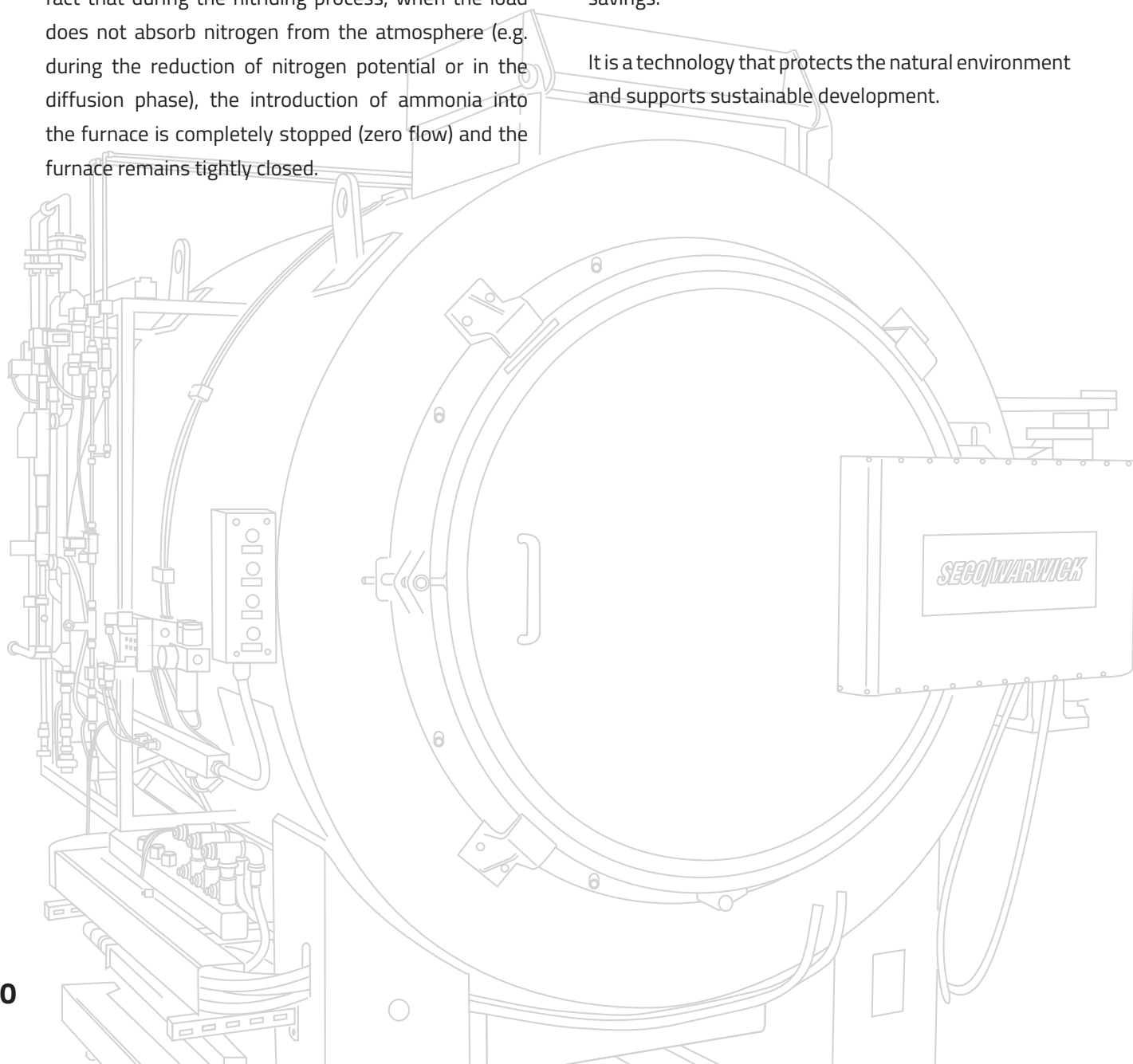
ZeroFlow is a modern variant of controlled gas nitriding ensuring the maximization of process effectiveness and efficiency as well as economic efficiency, significantly exceeding the results of traditional solutions. It allows for precise shaping of any nitrided layer composition while maintaining minimal media consumption and post-process gas emissions, meeting the most stringent environmental protection regulations.

The uniqueness of the ZeroFlow technology lies in the fact that during the nitriding process, when the load does not absorb nitrogen from the atmosphere (e.g. during the reduction of nitrogen potential or in the diffusion phase), the introduction of ammonia into the furnace is completely stopped (zero flow) and the furnace remains tightly closed.

This is a unique feature of the ZeroFlow technology and the VR and PVR furnaces dedicated to this technology. It enables the implementation of the most efficient nitriding processes, with minimum duration, energy and gas consumption, and post-process gas emission.

Compared to traditional processes, ZeroFlow reduces the ammonia and nitrogen consumption many times as well as gas emissions to the environment (up to 10 times), and at the same time contributes to energy savings.

It is a technology that protects the natural environment and supports sustainable development.



ZeroFlow

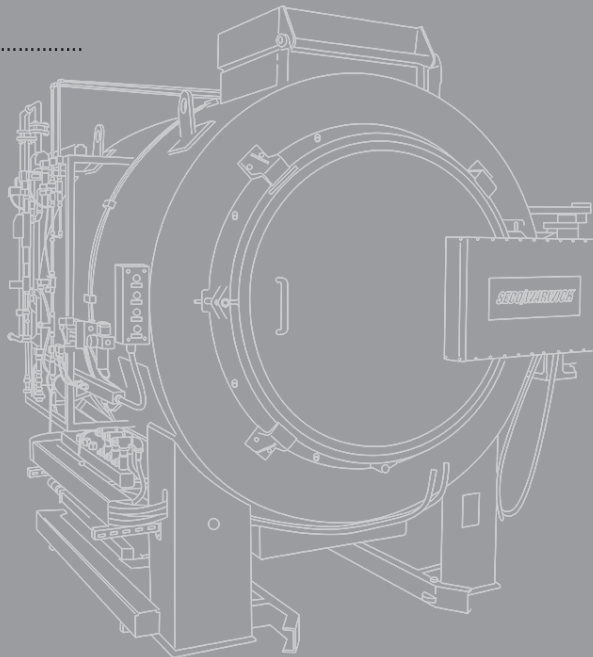
RETORT FURNACE FOR GAS NITRIDING PROCESS

INDUSTRIES

- / Automotive
- / Machine
- / Tool

TECHNOLOGY

- / Nitriding
- / Nitrocarburizing (FNC)
- / Post-oxidation
- / Tempering
- / Annealing



PROCESSES

- / Nitriding takes place in a tightly closed retort with forced atmosphere circulation.
- / The nitriding process is controlled by partial or complete closing of the ammonia inflow to the retort and controlled ammonia dissociation inside the retort.
- / During Zeroflow® nitriding, the temperature and nitrogen potential KN are controlled based on the measurement of the hydrogen content in the retort (and not at the furnace gases outlet). The current value of the nitrogen potential (KN) is compared with the set value (according to the recipe) and automatically regulated by the PLC control system by periodically dosing ammonia with a mass valve according to the PID algorithm.
- / The atmosphere discharged from the furnace is disposed of in order to meet the requirements of gas emissions to the environment.

ZeroFlow technology allows to maintain full versatility of conventional gas nitriding while minimizing media consumption, i.e. their significant reduction compared to competing technologies.

ADVANTAGES

- / Accurate shaping of any nitrided layer composition
- / Maximum efficiency and process performance
- / High quality and repeatability of results
- / Compliance with the environmental protection regulations requirements
- / Furnace's reliable operation in an automatic cycle
- / Precise control of the nitriding atmosphere directly in the retort
- / High accuracy of temperature control, uniformity $\pm 30^{\circ}\text{C}$
- / Computer control system based on PLC + IPC Siemens standards
- / Full automation and visualization of the heat treatment process
- / Simple and intuitive furnace operation and process recipe preparation
- / Compliant with AMS-2750, AMS-2759 and CQI-9 standards
- / Data archiving and reporting system
- / Preventive Maintenance function
- / Remote Diagnostics

FEATURES

- / Ability to use ammonia alone as the most efficient nitrogen carrier (without dilution with other gases, e.g. nitrogen or dissociated ammonia).
- / Minimal ammonia requirement, just to supply the necessary amount of nitrogen to the treated details in the tightly closed furnace (as opposed to the traditional process where the atmosphere is continuously flowing through the open furnace and only a small amount is used for nitriding).
- / The utilization of the furnace vacuum evacuation (instead of traditional purging with process gases), which significantly reduces the consumption of process gases (ammonia and nitrogen).
- / Precise and dynamic process control by directly measuring and controlling the nitriding atmosphere composition inside the furnace using only ammonia and internal dissociation.
- / It ensures very high accuracy of forming the required nitrided layer.

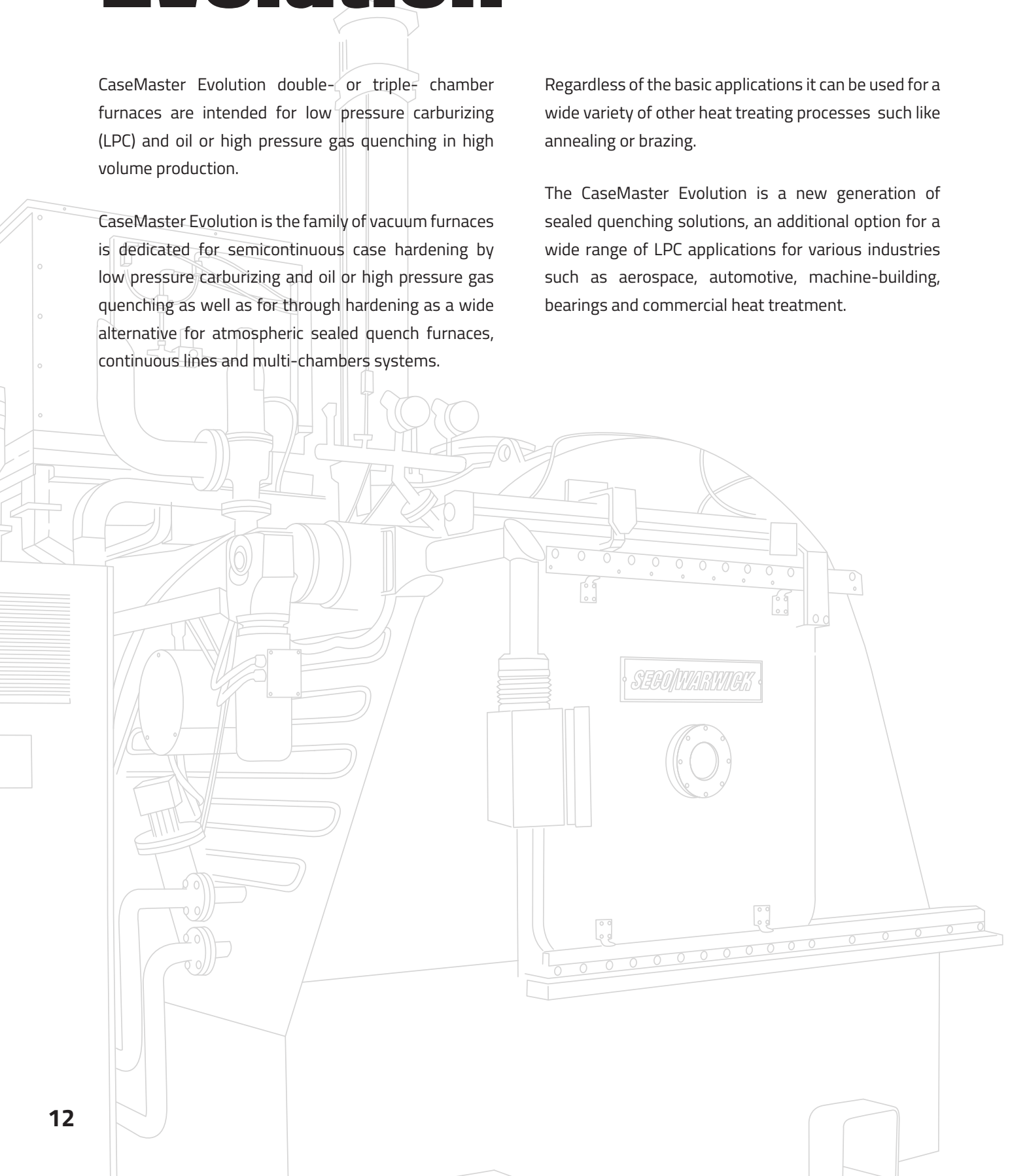
CaseMaster Evolution

CaseMaster Evolution double- or triple- chamber furnaces are intended for low pressure carburizing (LPC) and oil or high pressure gas quenching in high volume production.

CaseMaster Evolution is the family of vacuum furnaces is dedicated for semicontinuous case hardening by low pressure carburizing and oil or high pressure gas quenching as well as for through hardening as a wide alternative for atmospheric sealed quench furnaces, continuous lines and multi-chambers systems.

Regardless of the basic applications it can be used for a wide variety of other heat treating processes such like annealing or brazing.

The CaseMaster Evolution is a new generation of sealed quenching solutions, an additional option for a wide range of LPC applications for various industries such as aerospace, automotive, machine-building, bearings and commercial heat treatment.



CaseMaster Evolution

SEALED QUENCH VACUUM FURNACES FOR LOW PRESSURE CARBURIZING

TECHNOLOGIES

- / Hardening with oil quench or gas quench
- / Low pressure carburizing using FineCarb® with oil or gas quench
- / High-temperature carburizing up to 1050°C using PreNitLPC® for common case hardening steels
- / Carbonitriding
- / Bright thorough hardening
- / Oxidation in the pre-heating chamber
- / Annealing (with gas cooling)
- / Tempering
- / Quenching
- / Brazing.

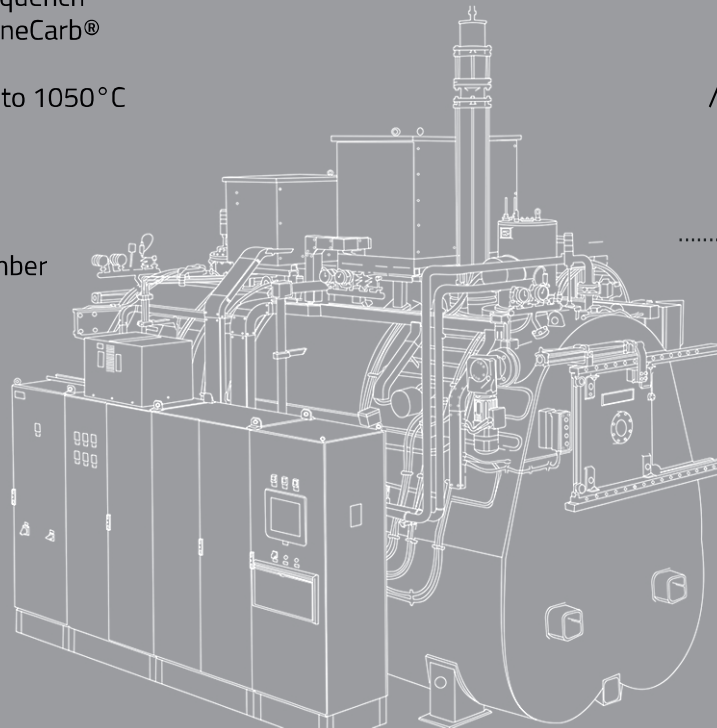
LPC, PRENIT, HV

INDUSTRIES

- / Gears & Transmission
- / Automotive
- / Aviation
- / Fabricated metal products
- / Machine-building
- / Fasteners
- / Mint

MATERIALS

- / Carburizing steels
- / Structural steel
- / Bearing steel
- / Tool steels
- / HSLA
- / Alloyed steels
- / Stainless steels
- / Alloys and super alloys
- / Titanium alloy



CMe Double- & Triple – chamber vacuum furnace
for low pressure carburizing (LPC) and oil or high
pressure gas quenching in high volume production.

ADVANTAGES

- / Fully automated processing
- / Vacuum, horizontal, double-, and triple-chamber
- / Graphite heating chamber
- / Low heat losses by increased thermal insulation
- / Low pressure carburizing (LPC)
- / Oil or high pressure gas quenching, nitrogen (N₂) or helium (He)

- / Vacuum and pressure tight inner doors ensure high purity of process and parts
- / Short workload-transport time within the furnace
- / Shorter evacuation times by independent pumping systems for each chamber
- / Uniform quenching and distortion reducing by stepless control of oil circulation system
- / Compact, modular design

CaseMaster Evolution-T

TRIPLE CHAMBER VACUUM FURNACE FOR LOW PRESSURE CARBURIZING LPC AND HIGH PRESSURE GAS QUENCHING IN SEMI-CONTINUOUS PRODUCTION MODE

TECHNOLOGIES

/ Case hardening LPC (Low Pressure Carburizing),
/ Quenching,
/ Brazing,
/ Annealing.

INDUSTRIES

/ Gears & Transmission
/ Automotive
/ Aviation
/ Heat exchanger
/ Bearing
/ Machine-building
/ Commercial Heat Treatment

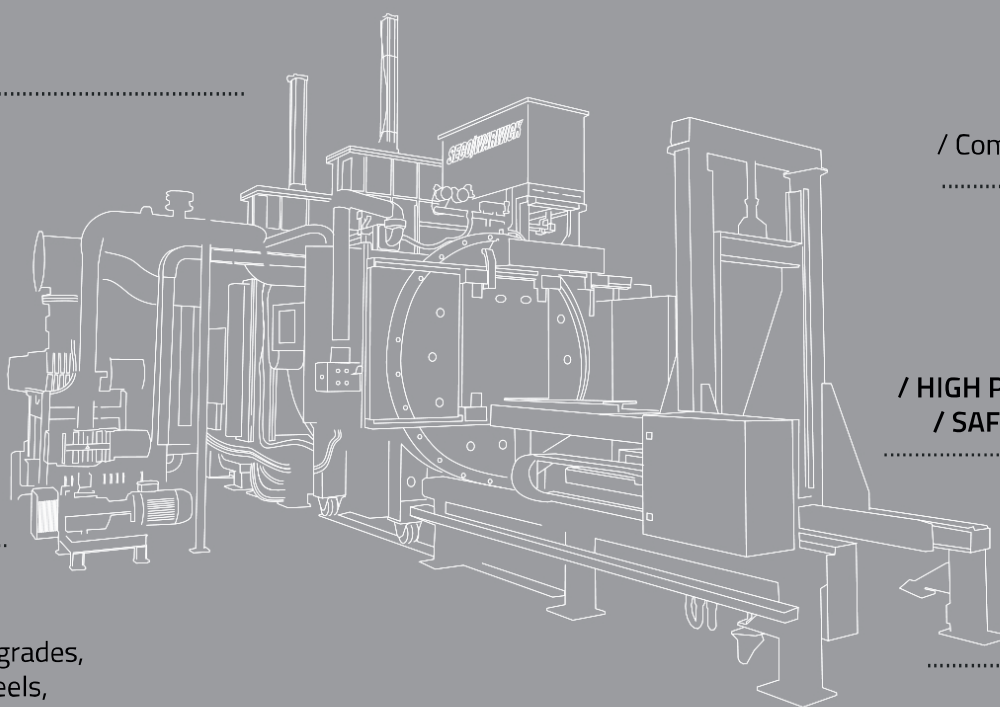
MATERIALS

/ Alloy steel,
/ Carburizing grades,
/ Stainless steels,
/ Specialty steels and alloys

/ HIGH PRODUCTION EFFICIENCY
/ SAFETY AND ENVIRONMENT

OUTSTANDING QUALITY

/ High precision and reliability of results
/ Ideal surface condition
/ Elimination of oxidation and IGO



CMe-T Cost-effective surface hardening by low pressure carburizing (LPC) and high pressure gas quenching in a triple chamber vacuum furnace.

The CaseMaster Evolution T is a triple-chamber vacuum furnace designed for high volume case hardening processing based on low pressure carburizing (LPC) and gas quenching in the semi-continuous production mode. It is built of three separated, functional chambers: loading and pre-heating chamber, process chamber (LPC), gas quenching and unloading chamber.

SUPER IQ

NEW GENERATION, MULTIPURPOSE, SEALED QUENCH FURNACE

INDUSTRIES

/ Commercial Heat Treatment
/ Machine Building
/ Agriculture
/ Transmissions
/ Automotive

TECHNICAL DATA

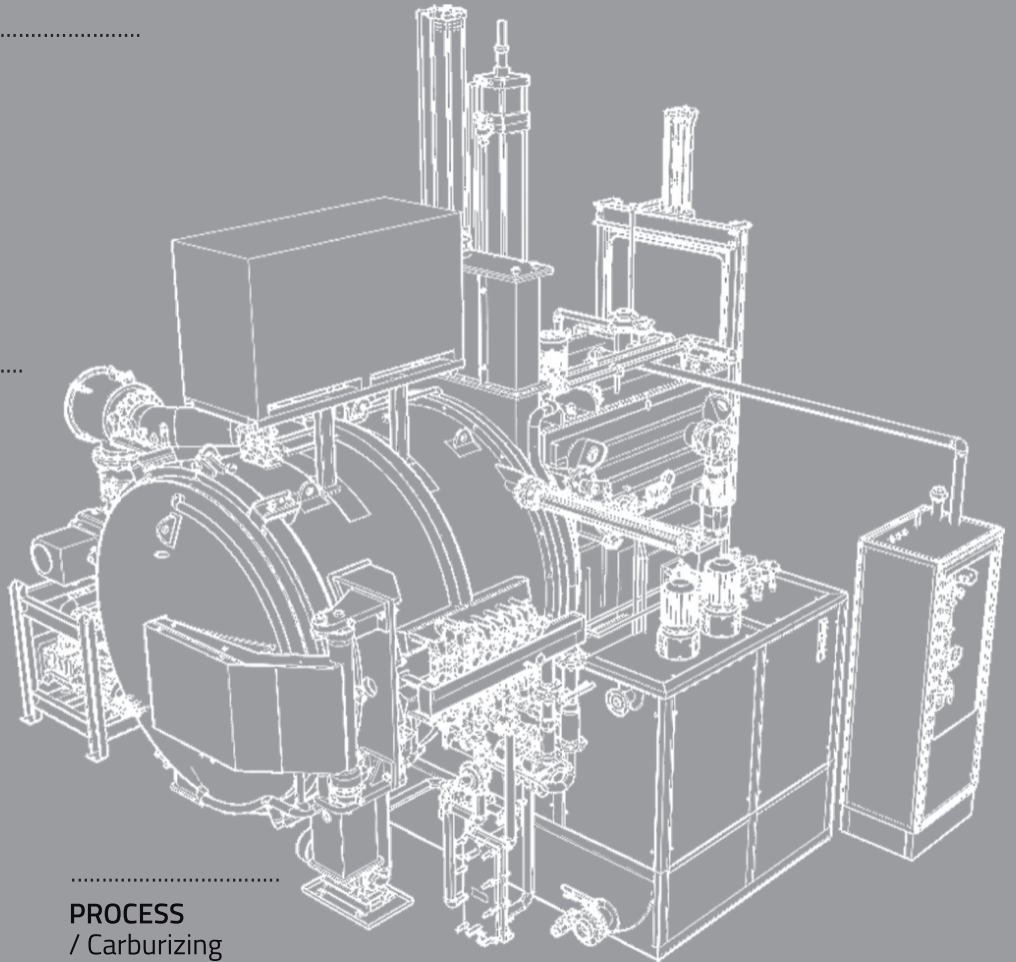
/ LOAD WEIGHT
up to 1 560 kg gross
/ USEFUL TEMPERATURE RANGE
400-1100°C
/ SIZE (WxHxL)
36" x 36" x 48"
910 x 910 x 1220 [mm]

PROCESS CONTROL

/ Fully automated operation
/ Fully automatic lines compatible
/ Automatic creation of process recipes
/ Direct cost report

PROCESS

/ Carburizing
/ Hardening
/ Annealing



SUPER IQ

Embodies an original idea of combining in one furnace, two well known, mature technologies of low pressure carburizing and atmosphere shielded oil quench. As a result, this new generation process, being reserved primarily to aerospace and automotive businesses has become affordable to other industry sectors.

ADVANTAGES

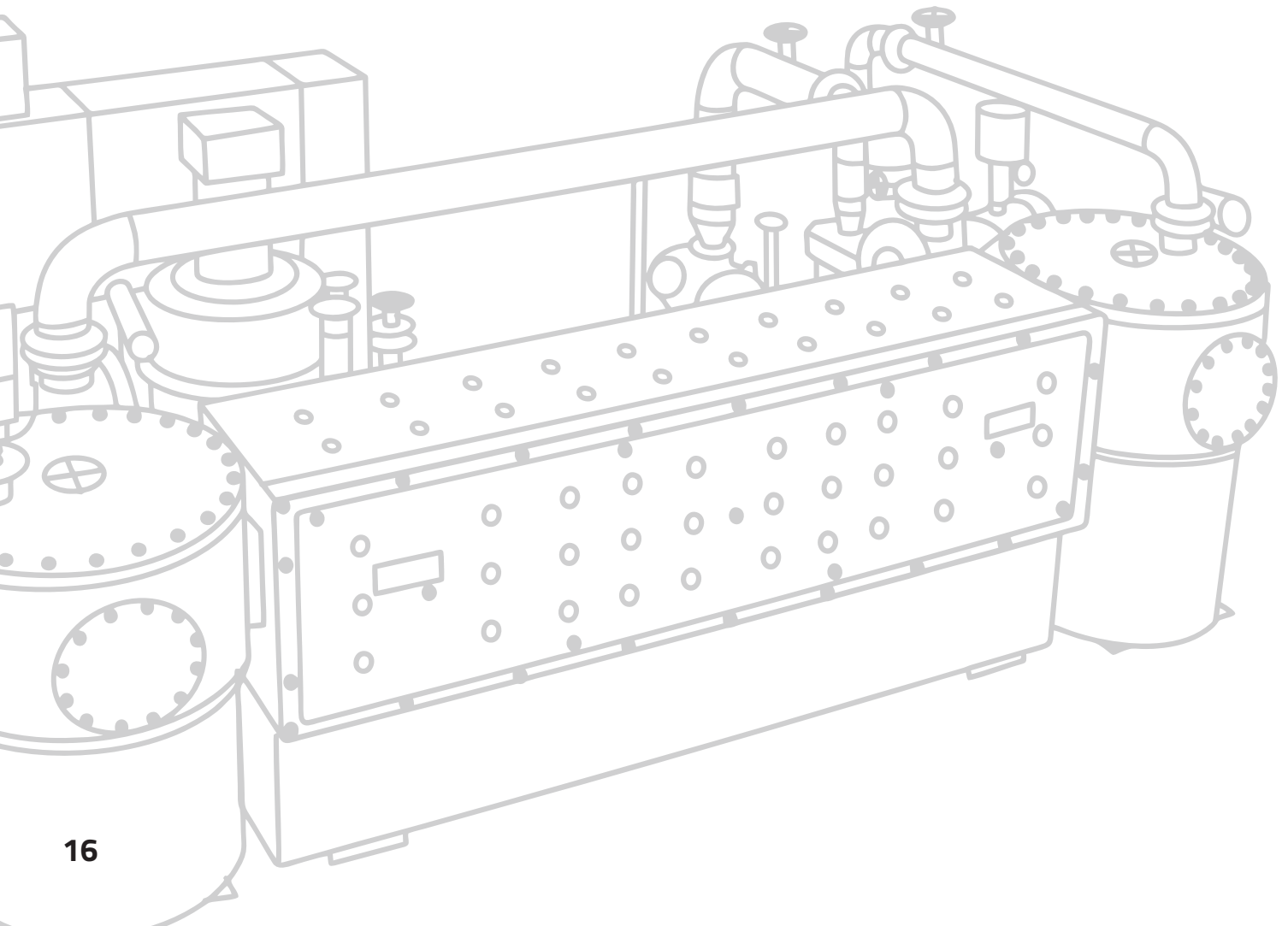
/ Lower total production cost > reduced treatment time thanks to the capability of carburizing with temperatures well above 925°C
/ Better quality > uniform layers, no IGO, better stress distribution, less distortion
/ Flexibility > turn it on, turn it off (no idling nor conditioning)
/ Easy integration > fits to any make Sealed Quench lines and their pits
/ "Process versatility +" > also the treatment of tools, higher process temperatures
/ Clean processing > no open flames, smokiness, emissions.
/ Elimination of an additional device > no ENDO generator needed

4D Quench

A vacuum system for single-piece nitrogen quenching with distortion control as an attractive alternative to a press quenching.

4D Quench – is a vacuum heat treatment system solution for individual quenching of component parts such as gears, shafts, bearing races, rings, selves, etc. made of standard or custom case and through hardening steels. The system operates under nitrogen. It provides excellent distortion control and notably increases precision and repeatability of heat treatment while reducing unit and overall production costs.

- / It notably increases precision and repeatability of heat treatment results and reduces production costs.
- / It provides vacuum heating following by powerful and uniform nitrogen quenching resulting in distortion control & reduction with high repeatability of final results.
- / The system is fully automated and easily integrated with in-line production.
- / It's a modern and attractive alternative to hardening in a press, eliminating all its disadvantages.



4D Quench

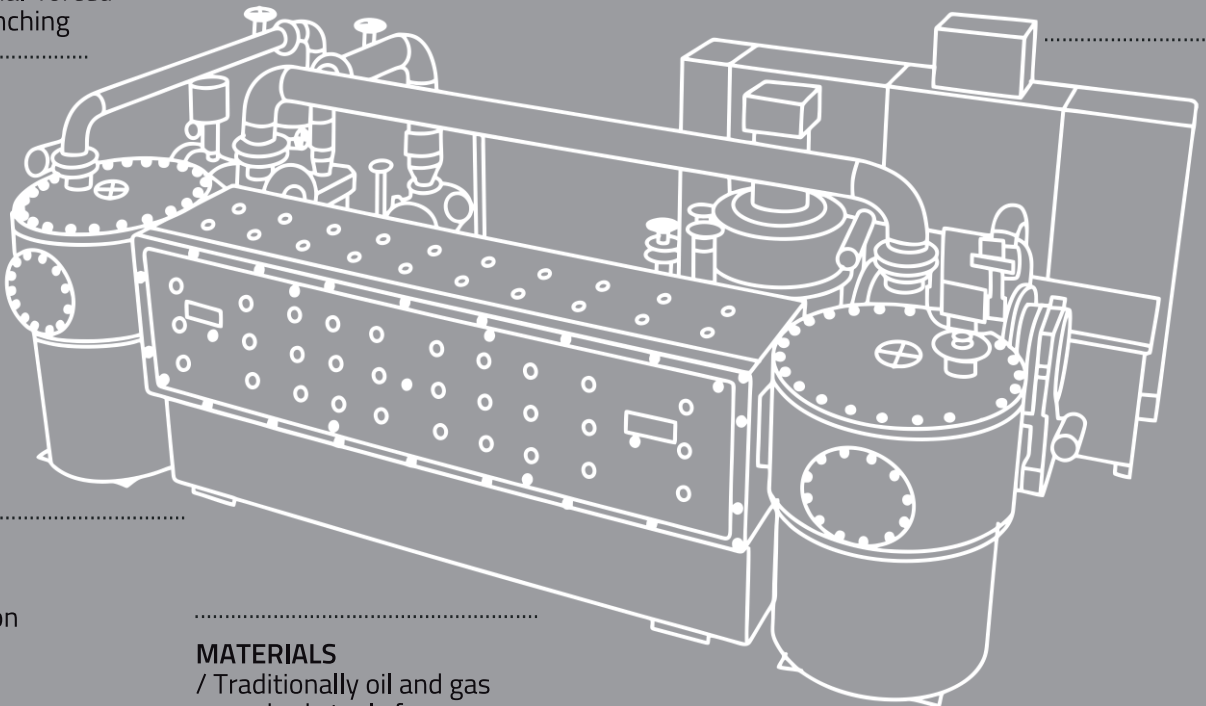
MODERN ALTERNATIVE TO PRESS QUENCHING

UNIQUE FEATURES

- / Single-piece flow
- / Vacuum heat treatment
- / 4 dimensional-forced nitrogen quenching

TECHNICAL DATA

- / WORKING ZONE
OD/H up to 500/150mm
- / VACUUM RANGE
10⁻² mBar
- / TEMPERATURE
to 1260°C



INDUSTRIES

- / Gear
- / Transmission
- / Bearing
- / Automotive
- / Aerospace
- / Machinery

MATERIALS

- / Traditionally oil and gas quenched steels for carburizing or through hardening applications
- / All press quenching steels

APPLICATIONS

- / High-quality transmission components, low noise, low bration, eCAR, eTRANS, eDRIVE

4D Quench Vacuum system for individual quenching with distortion control

FEATURES & ADVANTAGES

- / Reduction, control, and prediction of distortion >> significantly less distortion compared to oil batch quenching
- / Three-dimensional plus rotation >> 4D- free nitrogen quenching
- / Vacuum results >> accurate and repeatable
- / Elimination of oil >> clean

PROCESS CONTROL

- / Fully automated operation
- / Fully automatic lines compatible
- / Full monitoring and traceability
- / Automatic creation of process recipes
- / Direct cost report

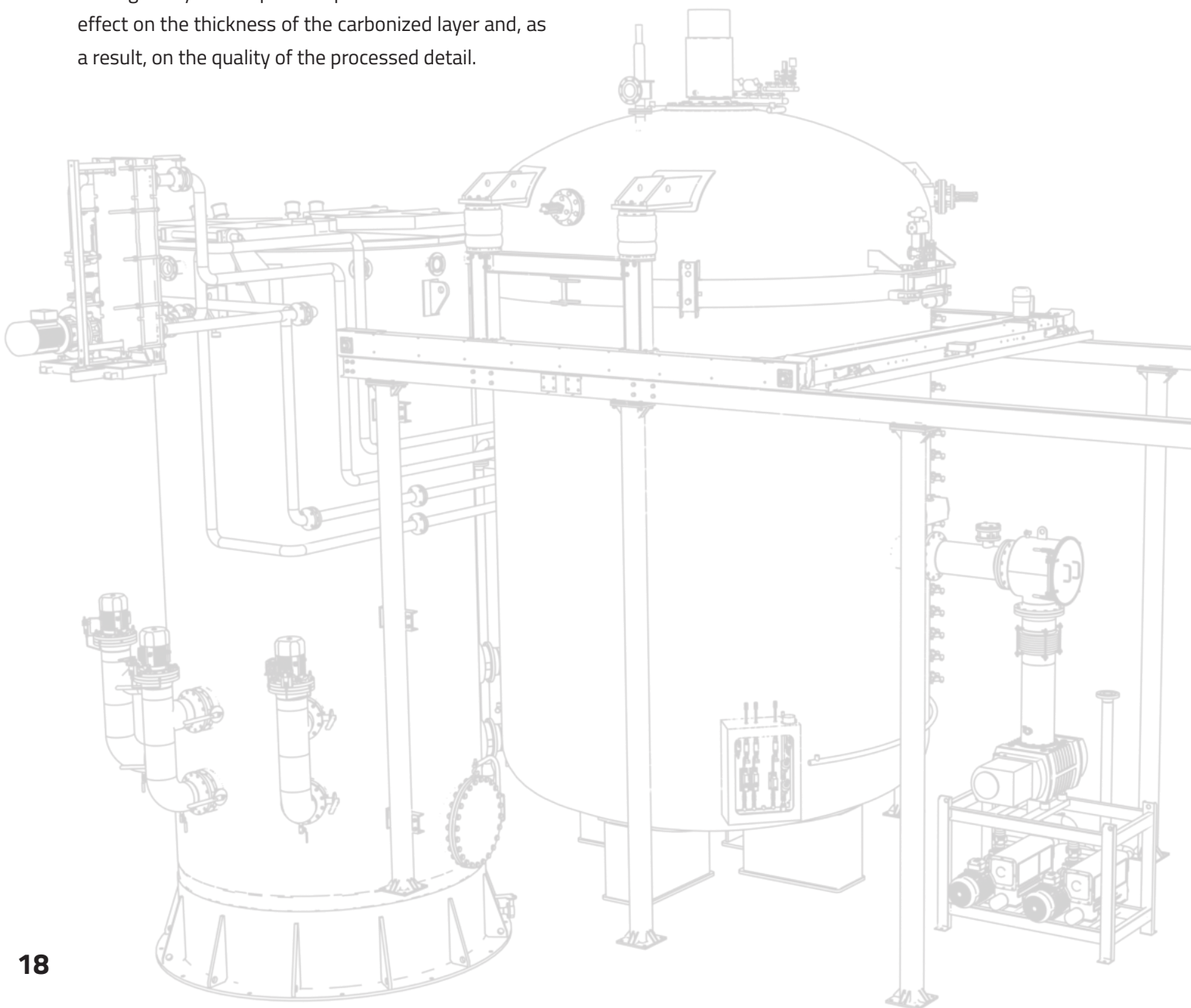
Pit-LPC

Pit-LPC – Alternative for atmosphere carburizing, which achieved the maximum potential. Pit furnace = cost reduction, taking care of the environment, production increase – all this is possible due to the process being carried out in vacuum and in higher temperatures.

This state-of-the-art pit-type gas carburizing furnace meets the most stringent ecological standards, while increasing the work safety through elimination of flammable and explosive atmosphere. High homogeneity of the process parameters has a direct effect on the thickness of the carbonized layer and, as a result, on the quality of the processed detail.

See what others do not see – win the market and gain an economic advantage:

- / Lower your production and maintenance costs.
- / Save time and increase productivity.
- / Be environmentally friendly by shortening the process time.



Pit-LPC

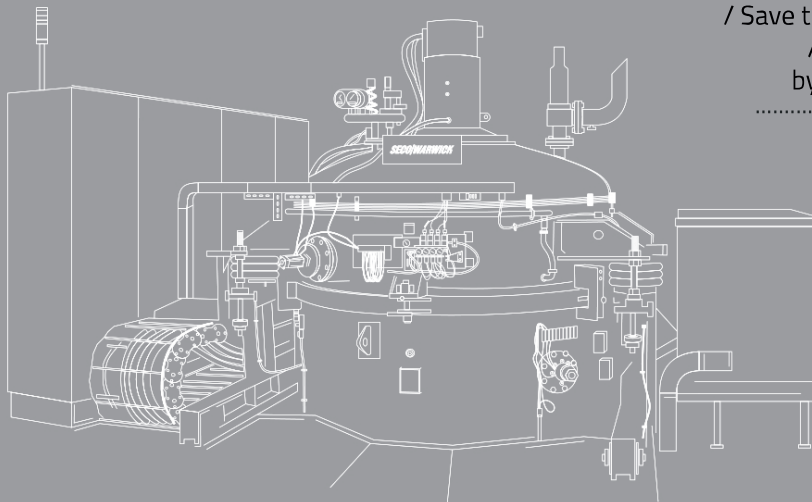
VACUUM PIT-TYPE FURNACE FOR CARBURIZING LARGE CASE DEPTHS OF MASSIVE AND LONGITUDINAL PARTS

FEATURES

- / Efficient and effective carburizing
- / Time savings
- / Energy savings
- / Space savings
- / Higher safety of use

ECONOMIC ADVANTAGES

- / Lower production and maintenance costs
- / Save time and increase productivity
- / Be environmentally friendly by shortening the process time



INDUSTRIES

- / Wind turbines
- / Heavy machines
- / Shipbuilding
- / Railway
- / Mining, oil & gas

MATERIALS

All steels for carburizing

Pit-LPC

Modern alternative for atmosphere furnaces
– 21st century Low Pressure Gas Carburizing (LPC) Pit Furnace
for large case depths

ADVANTAGES

- / The highest process quality and uniformity
- / Excellent surface quality
- / No intergranular oxidation (IGO) effect
- / Reduces the necessary media to the minimum = savings
- / Quick high-temperature process
- / Minimum consumption of process gases
- / Fast process initiation, gas purging is eliminated
- / Time savings due to the lack of necessity to prepare the process atmosphere
- / Safety => no flammable or explosive atmosphere
- / Low heat emission and no pollution (CO & CO₂)
- / Clean process
- / ECO Friendly

VAB Line

VACUUM ALUMINIUM BRAZING

VAB technology is gaining in importance due to its environmental friendliness and process cleanliness. VAB furnaces provide reliable and repeatable brazing results in a wide range of furnaces, tailored to each customer's expectations and requirements.

Known for years, VAB technology is gaining in importance due to its environmental friendliness and process cleanliness. VAB furnaces provide reliable and repeatable brazing results in a wide range of furnaces, tailored to each customer's expectations and requirements.

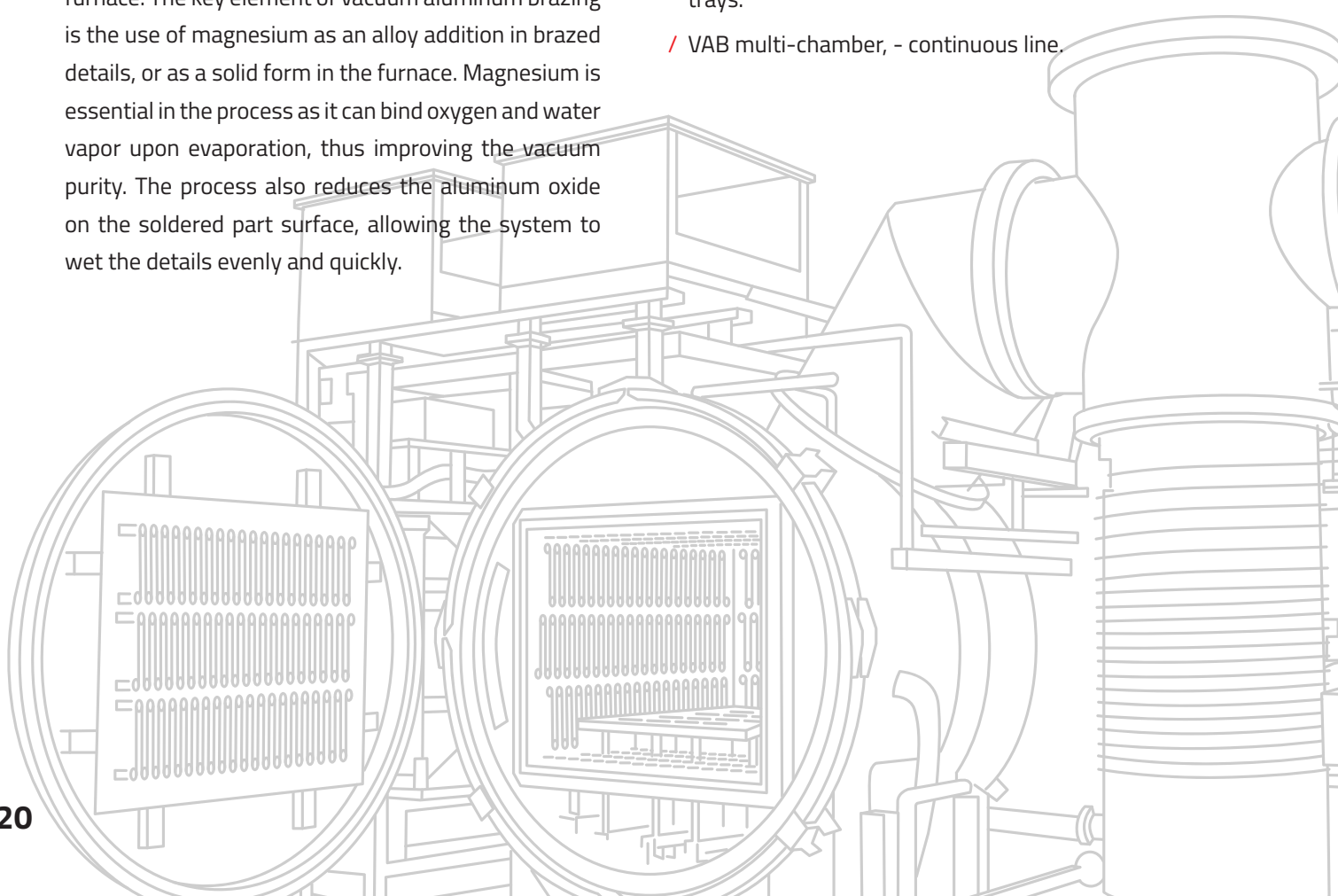
VAB furnace technology (fluxless brazing) is an ideal solution for vacuum aluminum brazing. During this process, the system eliminates the requirement for flux, which is not required to create joints with an alloy addition in brazed details, or in solid form in the furnace. The key element of vacuum aluminum brazing is the use of magnesium as an alloy addition in brazed details, or as a solid form in the furnace. Magnesium is essential in the process as it can bind oxygen and water vapor upon evaporation, thus improving the vacuum purity. The process also reduces the aluminum oxide on the soldered part surface, allowing the system to wet the details evenly and quickly.

Vacuum aluminum brazing has a very narrow range of acceptable process temperatures. As a rule of thumb, the filler metal must liquefy before the base metal reaches solidus temperature. In most cases, this temperature difference is very small (5-10°C), so the process temperature profile and the furnace's ability to achieve it is critical.

VAB technology is ideal for complex shapes, internal and multi-surface welds, different aluminum grades and their thicknesses.

VAB technology products can be divided into 3 types:

- / Batch VAB with a suspended load and a dedicated transport system.
- / Batch VAB with space dedicated to the aerospace industry and commercial heat treatment, loaded on trays.
- / VAB multi-chamber, - continuous line.

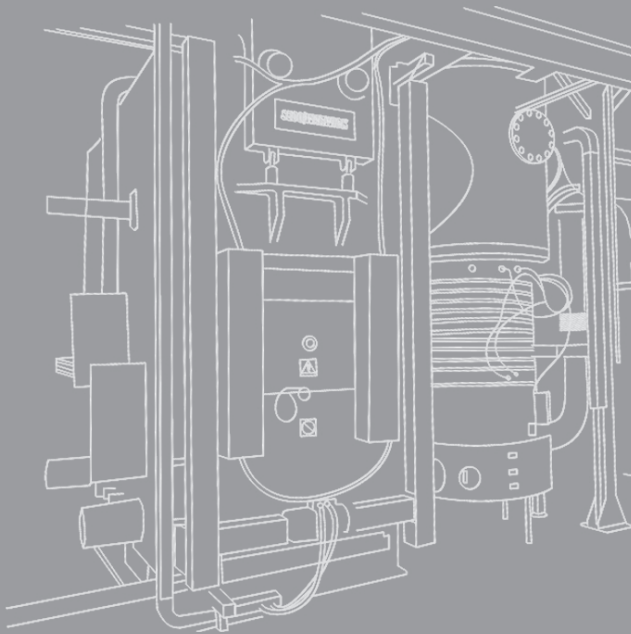


VAB Universal Chamber Furnace

FURNACES FOR VACUUM ALUMINUM BRAZING

INDUSTRIES

- / HVAC&R,
- / Aviation,
- / Automotive
- / Railway,
- / Electronics,
- / Generators and power plants,
- / Home devices.



CONTROL SYSTEM

- / Choice of control system – PLC, IPC
- / Managed power control system
- / Independent data logger
- / Remote control and monitoring
- / Air-conditioned control cabinet
- / Optional processes
- / Isothermal and controlled cooling
- / Tempering

OPTIONS

- / High vacuum through diffusion pump cryogenic, or turbomolecular
- / Higher temperature operation
- / Multi-chamber temperature control
- / Low-temperature and cryogenic trapping

UNIVERSAL CHAMBER FURNACE VAB

The VAB chamber furnace with a loading system is a device dedicated to the vacuum brazing of aluminum. By employing an effective and efficient technology that does not require flux, environmental safety can be significantly increased while ensuring reproducible results. This solution guarantees high heating uniformity and minimizes production shortages due to the optimized placement of heating elements, facilitating the maintenance of consistent conditions for each batch location.

BENEFITS:

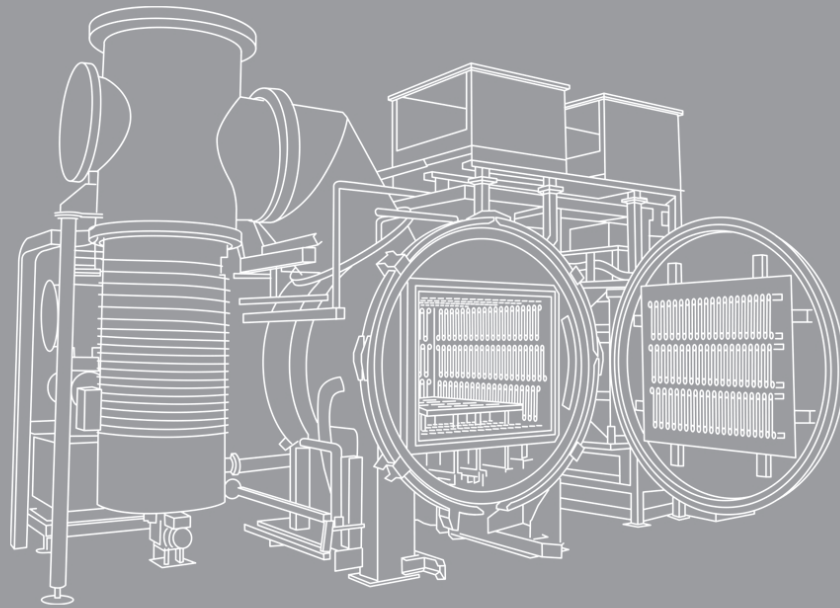
- / Repeatability of results,
- / Designed for integration with other devices (de-oiler),
- / Strong and durable soldered connections,
- / Cleanliness of parts with minimal oxidation,
- / High-quality and optimal surface protection for components,
- / Low energy consumption, as well as reduced use of process gases and other resources,
- / Environmentally friendly, with minimal emissions of process gases,
- / Simple, modular design tailored and adapted to the tasks and conditions of the facility,
- / Guaranteed quality and reproducible process results,
- / Support for preventive maintenance,
- / Remote control and monitoring capabilities,

VAB Batch Chamber Furnace

FURNACES FOR VACUUM ALUMINUM BRAZING

INDUSTRIES

- / HVAC&R
- / Aviation
- / Automotive
- / Railway
- / Electronics
- / Generators and power plants
- / Home devices



MATERIALS

- / All aluminum alloys that can be brazed with flux can be vacuum brazed

Additionally, some magnesium-containing aluminum alloys (e.g., the 5xxx series) which are not easily brazed using flux, can be vacuum brazed

- / By employing proper techniques, alloys from the 1xxx, 3xxx, 5xxx, and 7xxx series can be vacuum brazed

BATCH CHAMBER FURNACE VAB

The VAB chamber furnace is a specialized device designed for the vacuum brazing of aluminum. It employs an effective and efficient technology known as no-flux technology. This approach ensures environmental safety and allows for reproducible results. The VAB furnace line is tailored for semi-continuous or batch production of aluminum components, primarily catering to the automotive and aerospace industries.

BENEFITS

- / Uniform Temperature Distribution,
- / Consistent Results and Minimization of Non-conforming Products,
- / Easy Loading,
- / Can Be Integrated with Other Equipment (De-oiler),
- / Part Purity
- / No Oxidation.

FEATURES

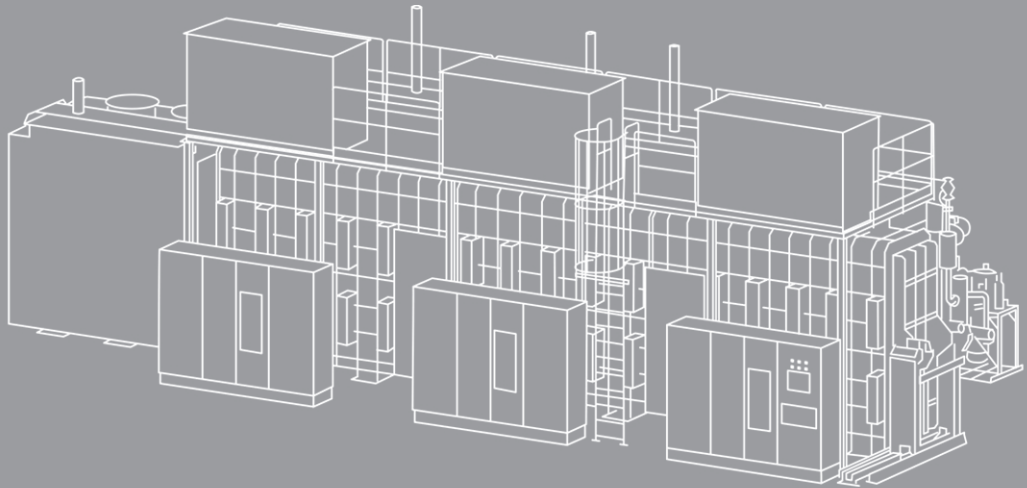
Vacuum fluxless brazing provides the advantage of eliminating flux inclusions and designing blind cavities, winding paths, and small transitions in brazed parts. This holds true without encountering the detrimental effects associated with flux removal and flux entrapment after the brazing process.

VAB Multi-Chamber Furnace

FURNACES FOR VACUUM ALUMINUM BRAZING

INDUSTRIES

- / HVAC&R
- / Aviation
- / Automotive
- / Railway
- / Electronics
- / Generators and power plants
- / Home devices



CONTROL SYSTEM

- / Choice of control system – PLC, IPC
- / Managed power control system
- / Independent data logger
- / Remote control and monitoring
- / Air-conditioned control cabinet

OPTIONS

- / High vacuum through diffusion pump, cryogenic, or turbomolecular
- / Higher temperature operation
- / Low-temperature and cryogenic trapping

MULTI-CHAMBER FURNACE

The VAB multi-chamber oven addresses the needs of customers seeking the highest efficiency and accommodating high production volumes. The capability to utilize a variable number of chambers enables the unit to be customized according to customer requirements.

BENEFITS

- / Repeatability of results,
- / Robust and durable brazed connections,
- / Modular design,
- / Cleanliness of parts with no oxidation,
- / High productivity,
- / Flexibility in process guidance,
- / Automation capabilities,
- / Solutions for rapid maintenance,
- / Fast cycles with high vacuum,
- / High quality and optimal surface protection of parts,
- / Low consumption of energy, process gases, and other utilities,
- / Environmentally friendly with minimal process gas emissions,
- / Simple, modular design tailored and adapted to the tasks and conditions of the plant,
- / Guaranteed quality and reproducible process results,
- / Preventive maintenance support,
- / Remote control and monitoring,



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SECO/WARWICK Group, with 7 companies located on 3 continents, has customers in nearly 70 countries with more than 5000 deployed solutions. The company provides standard or customized state-of-the-art heat processing and metallurgy equipment and technologies to leading companies in the following industries: automotive, aerospace, electronics, tooling, medical, recycling, energy including nuclear, wind, oil, gas, solar and production of steel, titanium, and aluminum.

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