

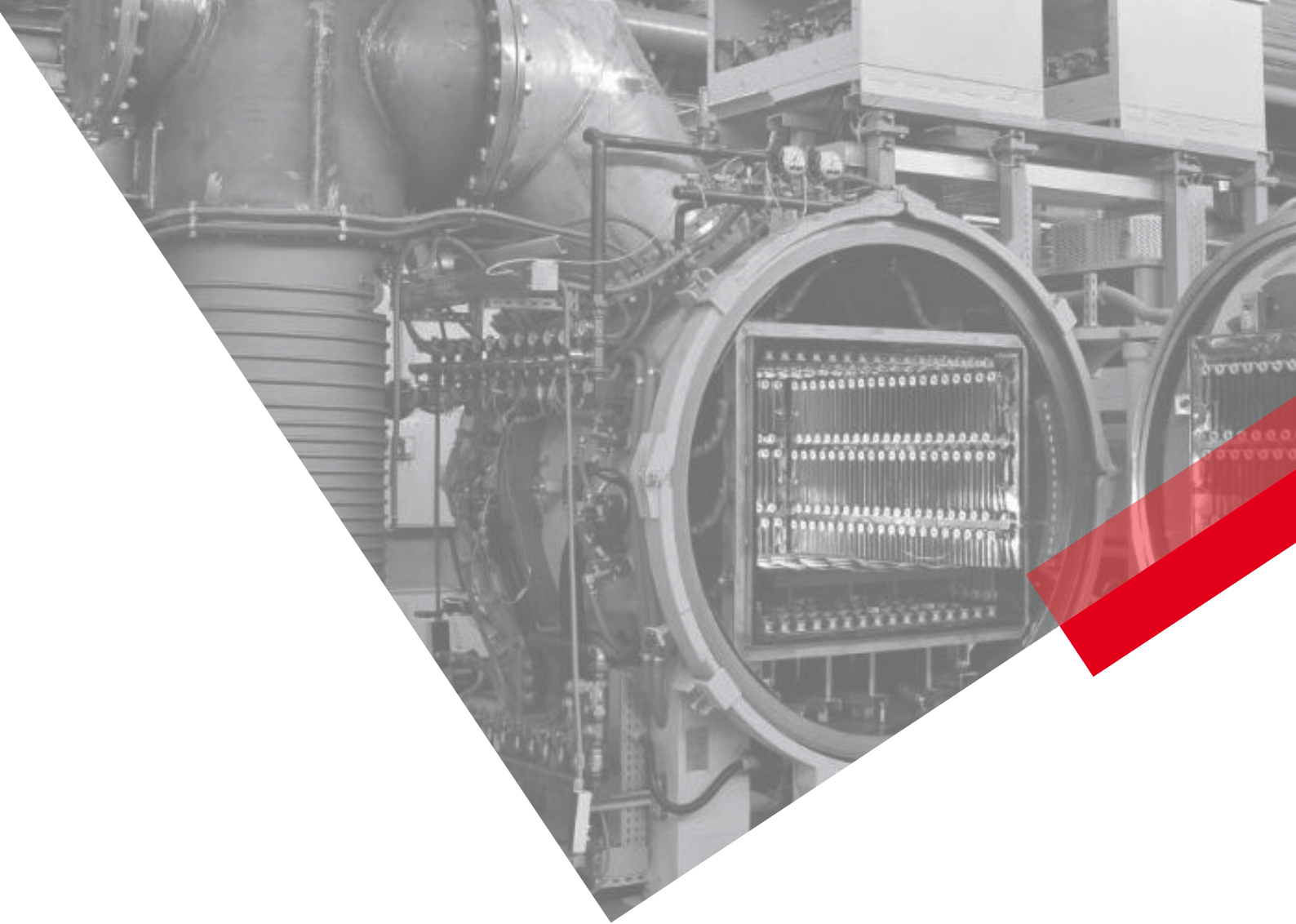
A black and white photograph of industrial machinery, specifically a vacuum aluminum brazing furnace, in a factory environment. The machine is a large, complex structure with various pipes, valves, and electrical components. A label on the machine reads "SECO/WARWICK". The background shows the structural elements of a large industrial building. A prominent red diagonal graphic element cuts across the lower right portion of the image.

**SECO/WARWICK**

INVENTION MEETS RELIABILITY

# VAB Line

Vacuum aluminum brazing furnaces



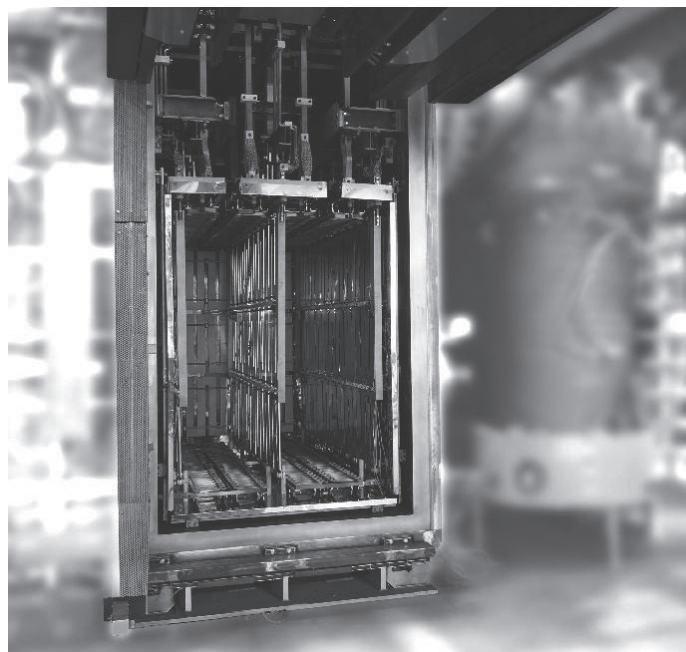
# VAB Line

## VACUUM ALUMINUM BRAZING

Known for years, the 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 customer expectations and requirements.

The VAB furnace with fluxless brazing technology is a solution for vacuum aluminum brazing. In this process, the system eliminates the need for flux, which is not used to create joints with an alloy addition in the 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 the 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. It also reduces the aluminum oxide on the soldered part surface, which enables the process to wet the part 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 are critical.



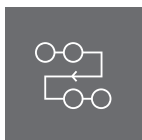


**VAB technology is ideal for complex shapes, internal and multi-surface welds, different aluminum grades, and various thicknesses.**



## BENEFITS

- / Oxygen-free brazing eliminates the cost of flux and its application.
- / Parts washing limited to pre-process washing.
- / After the process, the parts are clean with a dull gray finish.
- / Potential corrosion spots elimination thanks to flux elimination.
- / Environmentally friendly technology.
- / Repeatable results due to high temperature uniformity and high vacuum.
- / No residue or corrosion due to flux contamination.
- / High quality product.



## PROCESS

- / Brazing



## MATERIALS

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

be vacuum brazed. Using the correct techniques, the alloys of the 1xxx, 3xxx, 5xxx, 6xxx and 7xxx series can also be vacuum brazed.



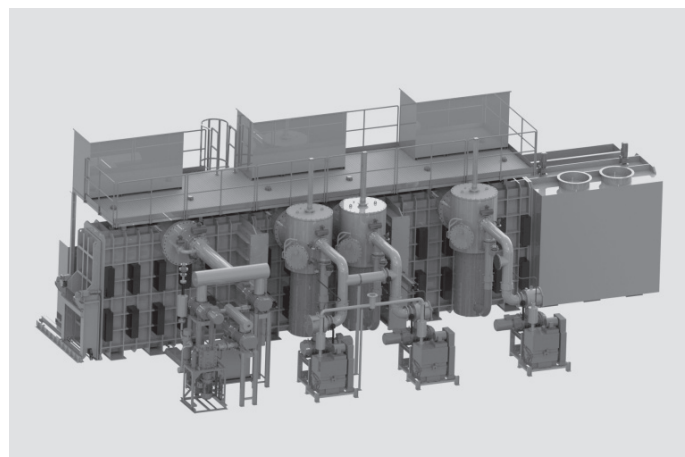
## INDUSTRIES

- / Heating, ventilation, air conditioning and refrigeration (HVAC&R)
- / Automotive
- / Aviation
- / Railway
- / Electronics and home appliances
- / Manufacturers of power generators and power plants

## VAB TECHNOLOGY PRODUCTS ARE DIVIDED INTO 3 TYPES

### VAB multi-chamber - continous line

This type of furnace is dedicated to those who expect the highest efficiency and shortest brazing time. Due to the large number of chambers, it is possible to shorten the brazing time several times over. The VAB multi-chamber furnace is a modular and flexible solution which can be adapted to special needs, in particular for very large production volumes and high performance. The fluxless technology process idea, ensuring



a significant increase in environmental safety, is the same as in the chamber furnace, but thanks modular chamber construction, it is possible to significantly increase efficiency, by using additional heating or subcooling chambers.

Models: 450 x 2000 x 3000 [cm] WxHxL

### **Batch VAB dedicated to the aerospace industry and commercial processing, with the batch loads configured on trays**

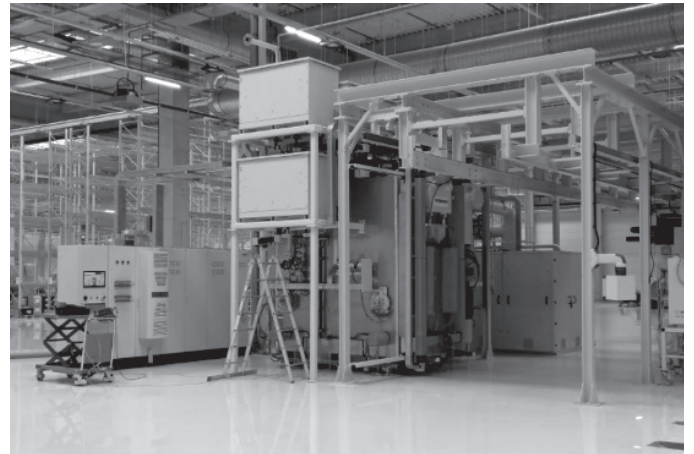
This product is used for larger heat exchangers and longer aluminum brazing processes.



### **Batch VAB with a suspended load and a dedicated transport system**

This solution is dedicated to vacuum aluminum brazing, when an effective and efficient fluxless technology is needed. It provides a significant increase in environmental safety while maintaining repeatable results. The solution ensures high heating uniformity and production shortage minimization, thanks to the heaters optimized location, ensuring the correct conditions for each load position.

Models: 450 x 1580 x 1780 [cm] WxHxL



### **Vacuum furnace for oil removal**

A vacuum oil separating system is used to remove oil remaining from the part forming or stamping process. It is performed before further heat treatment, most often brazing. This operation is necessary to ensure the proper cleanliness of the parts before the brazing process.

Oil removal involves heating the parts to the oil evaporation temperature in underpressure. The temperature in the furnace is controlled using a multi-zone heating system, which allows precise control and regulation of the temperature. A specially designed pumping system removes oil vapors from the furnace space, which are then condensed in the exhaust system. The recovered oil is stored in a dedicated tank.

### **VAB Furnaces for Research and Development**


The R&D department has developed a new furnace dedicated to VAB trials and processes. This is a unique opportunity to independently test the performance of VAB technology and verify new aluminum alloys for Flux elimination. With this innovative solution, customers have the opportunity to explore the latest developments in the heat treatment industry. The new VAB furnace in R&D represents a breakthrough in testing



SECO/WARWICK







## SECO/WARWICK Invention Meets Reliability

SECO/WARWICK is the **1<sup>st</sup> Choice Supplier**  
of Solutions for Heat Treatment and Metallurgy.

We create innovative products that provide our customers with reliable, safe and environmentally friendly solutions for heat treatment and metallurgy and ensure the economic efficiency of their businesses. Expertise includes end-to-end solutions in 5 categories: vacuum heat treatment, atmosphere, and aluminum thermal processing, controlled atmosphere brazing of aluminum heat exchangers and vacuum metallurgy.

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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