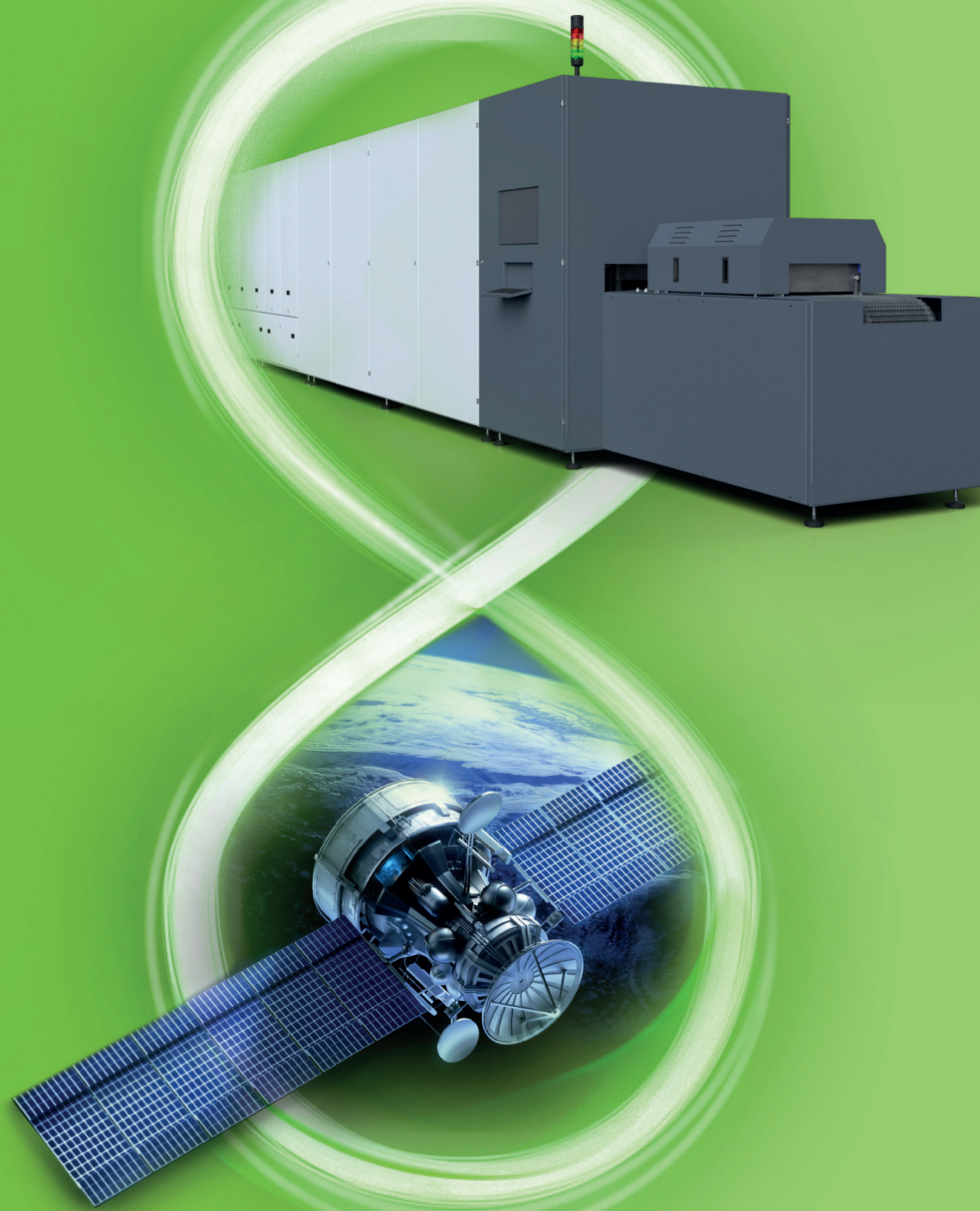
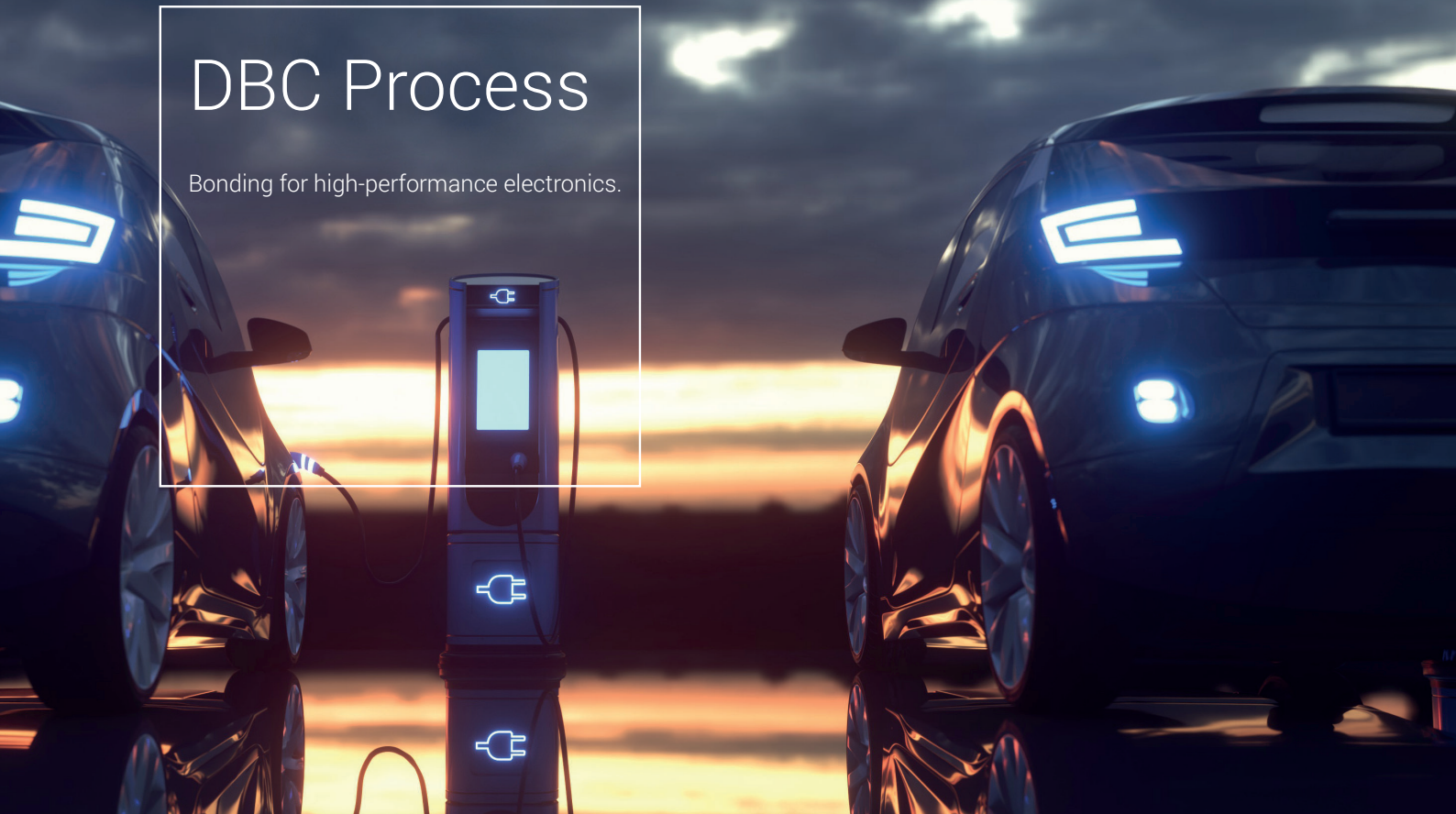


Inert high temperature processes for DBC manufacturing and other applications



DBC Process

Bonding for high-performance electronics.



Safe power electronics through high-performance DBC substrates

Power electronics are being used in more and more applications. This is not surprising, because the DBC components used in power electronics have excellent thermal conductivity and outstanding mechanical properties. These are essential for heat dissipation and insulation, especially for power modules, and are therefore predominantly used in the particularly demanding applications of high-performance electronics.

The use of power electronics in future-oriented application areas - such as electromobility or aerospace - leads to high demands on the switching speed and reliability of the modules.

For this reason, DBC substrates are being used more and more frequently. With the RSS-IHT series, Rehm offers reliable systems for the efficient production of durable DBC substrates. Many years of know-how in the field of thermal processes for electronics manufacturing formed the basis in the development of the RSS-IHT series and ensures the necessary process reliability.

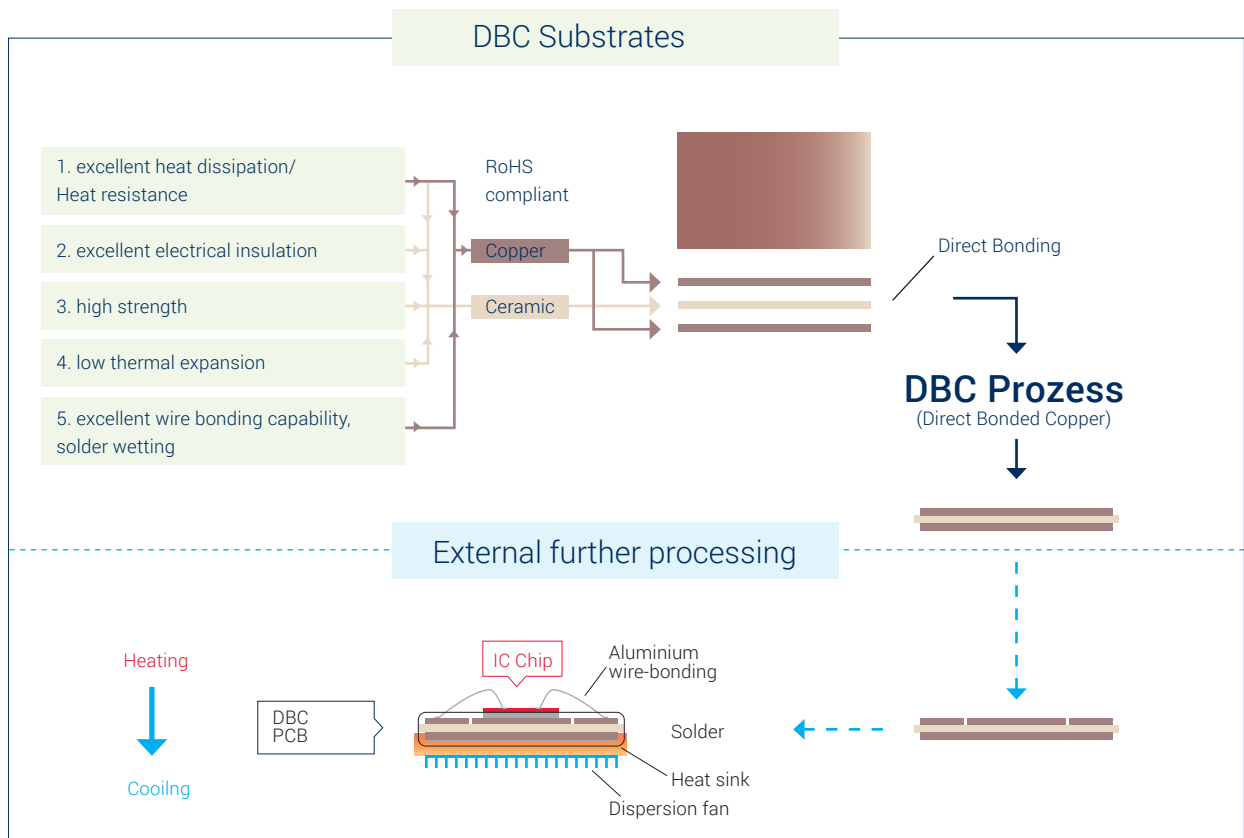
Optimal thermal management for high-performance semiconductor modules

A primary application for the continuous furnaces of the RSS-IHT type is the bonding step for the production of DBC (Direct Bonded Copper) substrates. In this process, a eutectic forms between the ceramic and the copper, combining both initial substrates into a substrate with optimum holding power, thermal and electrical properties for use in power electronics.

The demanding temperature process with a temperature between 1065 °C and 1085 °C takes place in an inert atmosphere with a residual oxygen content of <5 ppm.

A temperature homogeneity of ± 1.5 K for the cross profile as well as controlled cooling to an outlet temperature of < 80 °C are further process requirements that are met by the furnace.

The systems of the Rehm RSS-IHT series have been developed to meet these requirements and are all based on the same basic design concept. The number and length of the heated zones as well as the width of the transport system differ depending on the customer's specific production requirements.



- Optimum electrical conductivity due to virtually oxide-free surfaces
- Reliable, reproducible process
- Flexibly adaptable to the required throughput

Innovative design concept for highest flexibility

With manufacturing equipment from Rehm, your production can meet all requirements! We offer different systems of the IHT-Furnace for optimal manufacturing processes, adapted to the most diverse requirements. Depending on the application and throughput, different process zone lengths and transport widths are available.

Special attention during the development of the IHT-Furnace was paid to ease of maintenance. For example, the plant can be separated into several segments for transport purposes if required. Easily removable panels ensure optimum accessibility to the plant for maintenance or when replacing muffles. Another highlight is the split insulation. This makes it possible to lift the upper part of the insulation for easy maintenance or complete muffle replacement if required.

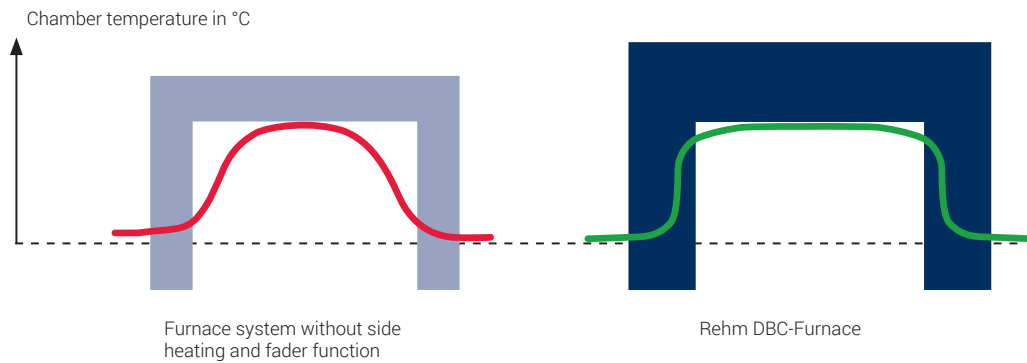


- › Safe process due to optimal thermal management
- › Stable transverse and longitudinal profile of +/- 1.5K
- › Controlled cooling down to < 80 °C
- › Different designs, depending on the required throughput

Rehm Fader-Function

With the proven fader function, the upper, lower and additionally the lateral heating elements are controlled separately, thus increasing the flexibility of the profile.

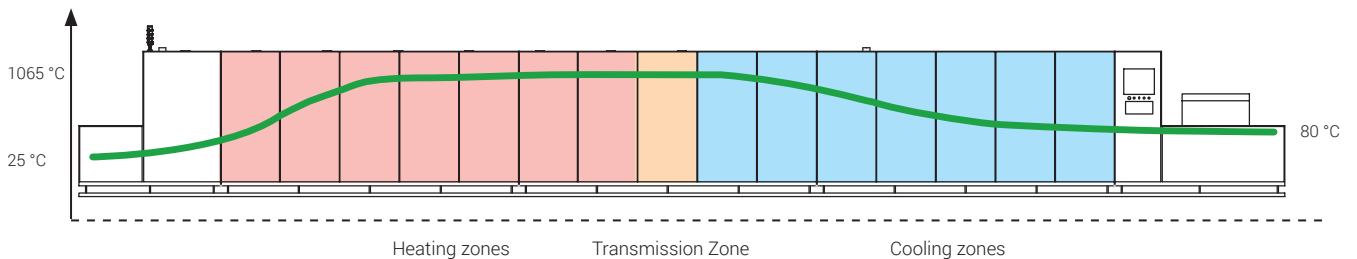
This allows the temperatures to be controlled in a closed control loop. The corresponding parameters are stored in the ViCON - plant software and can be easily managed and logged.



Homogeneous temperature profile

Optimum zone separation and a gas-tight process chamber over the complete manufacturing process ensure a reliable and homogeneous temperature profile.

A temperature homogeneity of ± 1.5 K for the transverse and longitudinal profile as well as controlled cooling to an outlet temperature of < 80 °C safeguard the process.



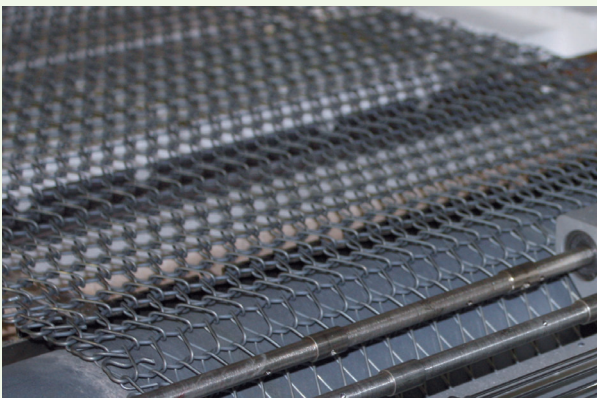
Reliably from A to B

Proven transport system

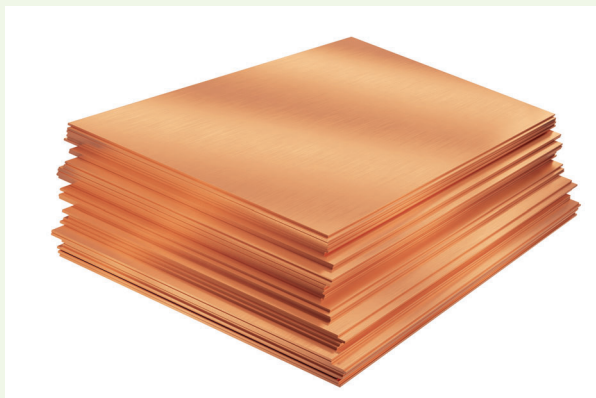
The DCB substrate passes through various areas of the plant during the bonding process: from the preheating zone, through the peak zone, to the cooling section. An important component for a continuous process is safe transport. The globally proven standard belt transport ensures smooth transport along the entire length of the line.

In standard applications, the products are conveyed through the furnace system in the Si-C goods carrier on a metal belt. The belt system is designed as a spiral link belt made of NiCrV with a belt width (depending on the system design) of 300 mm. In the final section of the cooling zone, the product is transferred to a separate cooling section conveyor, which cools it further to the run-out temperature. In addition, the separate transport units reduce the energy required for further cooling, thus saving operating costs.

Safe, vibration-free, reliable - the highest level of assembly expertise, top-quality materials and the sophisticated concepts of our transport system guarantee reliable transport of your DCB substrates.



Spiral link belt



Copper substrates for bonding processes

- › **Worldwide proven standard belt conveyor with braided belt**
- › **Low vibration for safe Si-C fabric carrier transport**
- › **Different transport widths depending on system design**
- › **Distortion and warp-free despite high process temperature**
- › **Energy and cost savings due to split transport in the cooling section**

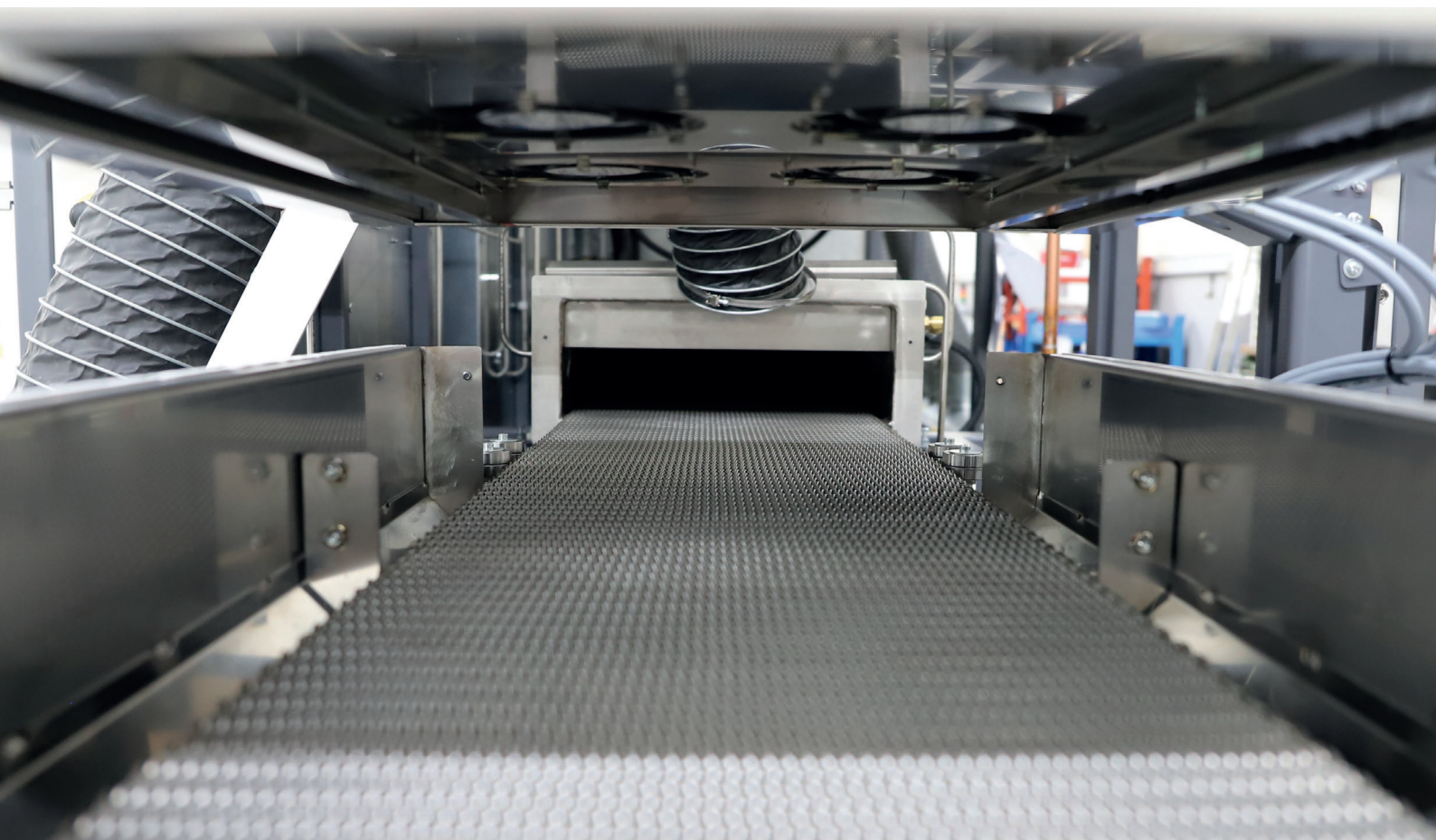
Stress-free to below 80 °C

With powerful cooling system

In order to cool down inertly and efficiently to below 80 °C following the peak range with process temperatures of over 1000 °C, a powerful cooling section is required. Gentle and long cooling is particularly important here. The concept of the cooling section of the IHT-Furnace consists of three stages. This ensures that the products are cooled to the optimum outlet temperature without stress.

The cooling section is designed as a closed system with three stages for slow cooling that is gentle on the product. The first stage consists of passive cooling. Then, in stage 2, active cooling is provided by cooling loops on the top of the chamber. The final stage is stage 3 with cooling loops mounted all around. The cooling capacity can be adjusted according to the process specifications via the integrated cooling water control.

- › Transmission zone for product transfer to the cooling section
- › 3 independent cooling stages
- › Separate cooling section conveyor for stage 3
- › Outlet temperature of the products < 80 °C



Optimum process atmosphere through innovative gas management

The process atmosphere of the IHT furnace allows very precise adjustment of the residual oxygen content to up to 5 ppm. If required, higher concentrations can also be achieved by selective admixing of air.

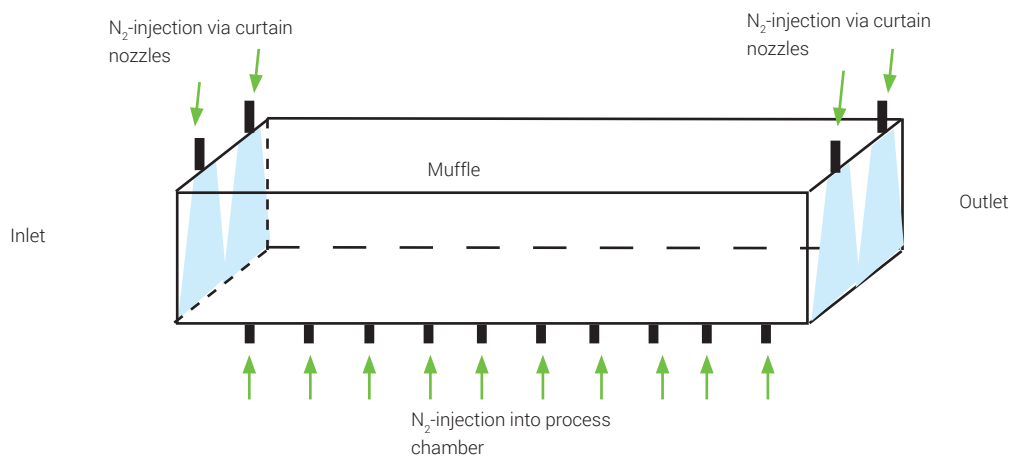
In the process chamber, the gases N_2 and air are controlled via flow meters for N_2 and mass flow controllers for air in the process chamber. The settings are displayed and monitored on the ViCON plant software.

The inlet for N_2 and air is pressure monitored. In the event of an error, alarm messages are displayed directly in the ViCON and additionally signaled via the traffic light.

Two N_2 gas distributors are implemented in the inlet area of the process chamber (muffle). This creates a gas curtain to prevent oxygen from the atmosphere surrounding the furnace from entering. The gas provided from the curtain nozzles is extracted via an exhaust system at the end of the inlet airlock.

The gas supply for inlet and outlet is equipped with two electric flow meters. The systems of the RSS-IHT series are equipped with an air doping function. This function influences the residual oxygen content of the furnace atmosphere by selectively adding oxygen to the nitrogen fed into the furnace. Precise control thus ensures a residual oxygen content of < 5 ppm and provides reliable control of the atmosphere.

Gasflow process chamber



- N_2 -feed at inlet and outlet via curtain nozzles as airlocks
- Air Doping for targeted oxygen supply
- Precise injection principle for gas supply
- Control and monitoring via ViCON operating software

Innovative Software

User-friendly and simple operation

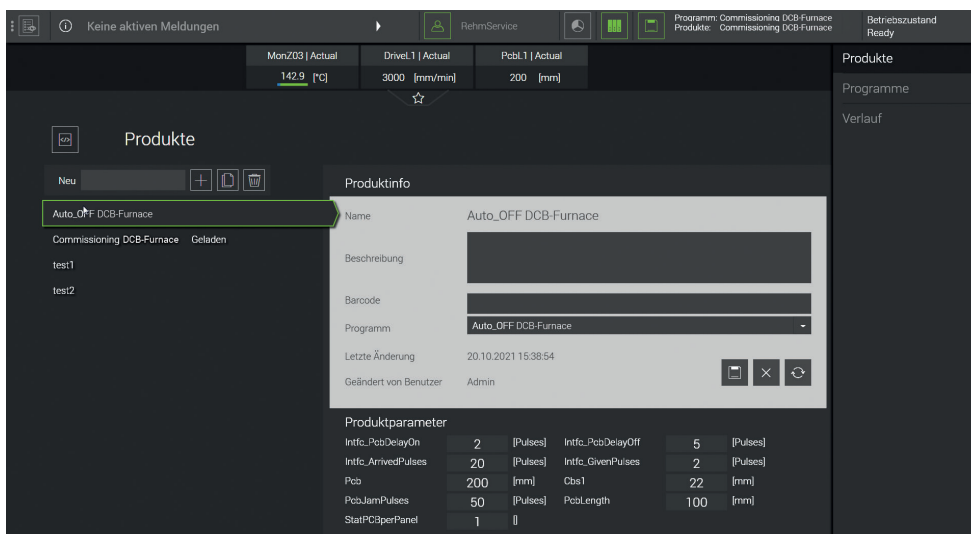
With ViCON, Rehm offers a clearly arranged software for the IHT furnace, which can be operated intuitively thanks to its touch surface.
operation thanks to its touch interface.

All messages, commands and parameters are visible at a glance in the main screen with machine view. With numerous features, such as a freely configurable favorites bar, the structured grouping of parameters or the individual process tracking and documentation, ViCON optimally accompanies you in your manufacturing processes.

During the development of the software, the experts at Rehm have refined the product management, among other things.

The creation of new products or the copying of certain properties is possible in parallel during production on the machine. The parameters for the new creation can be selected directly, so that the production process can continue faster and without interruption. In addition, the operating status allows you to see immediately which action mode the system is in. Faults can be better differentiated and alarm messages can be quickly and reliably evaluated.

Another plus of ViCON is the defined user administration. By assigning specific user roles, each user is given exactly the rights he needs to operate and work on the plant - without a rigid hierarchy.



Clear product management with offline programming

- › Intuitive software operation with multi-touch interface
- › Clear product management with offline programming
- › Parameter transparency through module groupings
- › Individual customization through favorites bar
- › Multilingual software



1. Alarms

In the upper area of the screen, you can immediately view, interpret and edit alarm messages.

2. Favorites bar

Here you can store selected values. These then appear on the main mask and on each page at a defined position.

3. Status bar

In the status bar you will be informed about the operating mode of the system by means of colored markings.

4. Machine view

The machine view provides you with an overview of the modular structure of your plant, the current loading situation and the status of the process zones.

5. Options

The machine options can be defined depending on the plant equipment. For this, up to 10 different options are available for your manufacturing process.

6. Display range

In the display range all actual values of the profile parameters such as temperature, filter or power consumption of the plant are displayed.

Facts and figures: RSS-DBC-Furnace

Size:

System length:	ca. 17000 mm
System length:	ca. 1800 mm
System length:	ca. 2000 mm

Technical specifications:

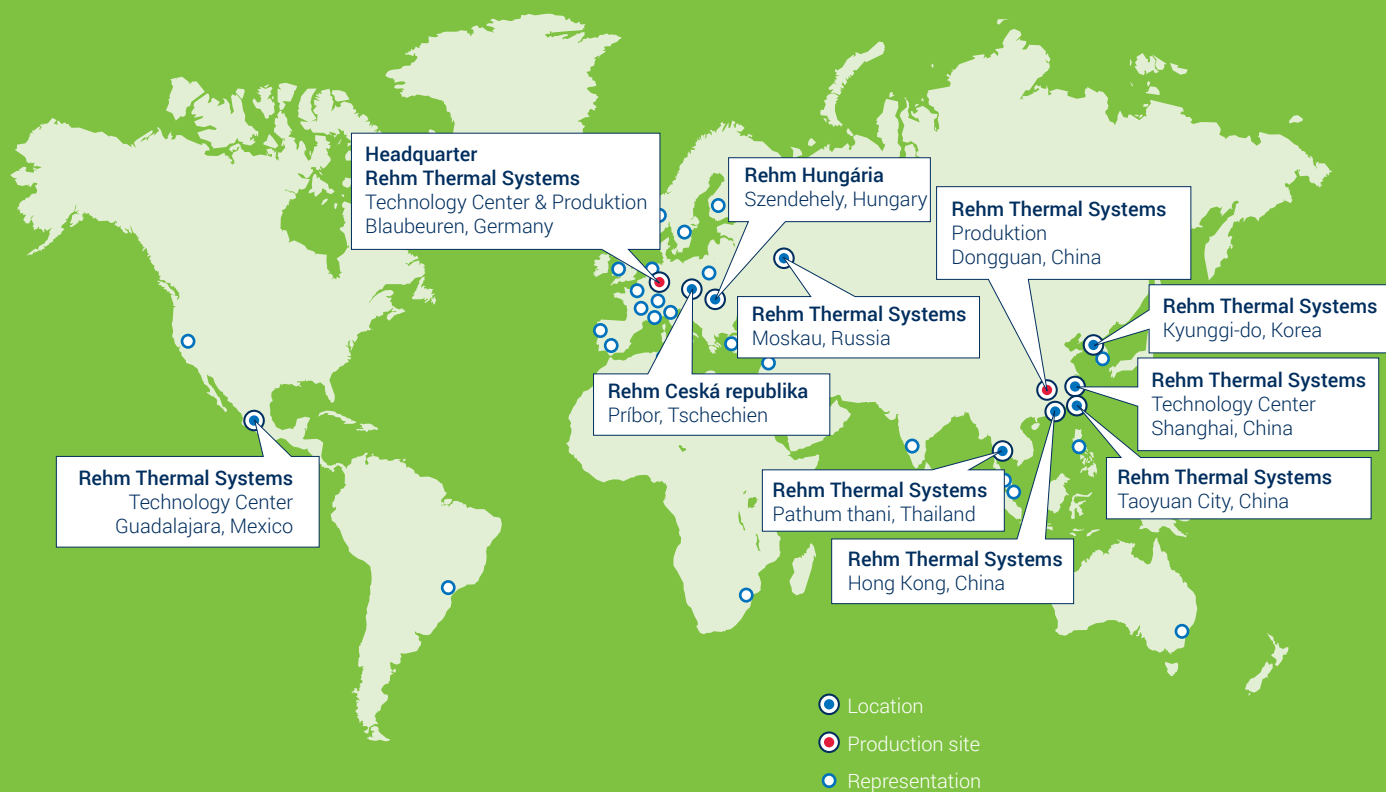
Products:	DBC-Substrate (in Si-C goods carrier)
Process chamber length:	approx. 6000 mm
Total number of zones:	16
Preheating zones:	6
Peak zones:	10
Process profile reproducibility:	+/- 1 K
Max. permissible system temperature:	1200 °C
Cooling section length:	approx. 5000 mm
Product outlet temperature:	< 80°C

Transport:

Transport system / material:	Spiral link belt/ NiCrV
Belt width:	300 mm
Clearance over transport:	70 mm
Transport system version:	shared
Transport height:	950 +/-50 mm
Transport speed:	50-300 mm/Minute
Passage direction:	left-right

Additional information:

Weight:	ca. 12 to
Color (frame/cladding):	RAL 7015 / SF700
Electrical power:	200 KW



Rehm Worldwide

As a leading manufacturer of innovative thermal system solutions, we have customers on all continents. With our own locations in Europe, the Americas and Asia, as well as 27 agencies in 24 countries, we are able to serve the international markets quickly and provide excellent service on site - worldwide and around the clock!