THERMAL SYSTEMS

review

Customer Magazine, Issue 02 | 2025

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Dear Readers,

Under the trade fair motto “Create your Connections”, we warmly invite you to productronica 2025. At a time when networking, data intelligence, and efficiency are increasingly decisive for success, we will demonstrate how Rehm connects people, machines, and processes through innovative solutions.

A particular highlight of our exhibition appearance is ViCON AiDe – the digital assistant available on all VisionXP+ systems and the Protecto series. It supports operators directly at the system, answering questions about soldering technology, system operation, or troubleshooting within seconds, drawing on the collective knowledge gained from 35 years of Rehm experience.

35 years of Rehm Thermal Systems – this is an achievement we are truly proud of. Three decades of technological passion, reliable partnerships, and shared success. We would like to celebrate this milestone with you – at our trade fair party on Wednesday evening after the show closes, directly at our booth.

As experts in connection technology, we understand how vital real connections are – both technical and human. Especially in challenging times, trust, continuity, and collaboration matter more than ever. Let us harness this strength to shape the future of electronics manufacturing together.

We look forward to meeting you in person!

With warm regards

Johannes Rehm
General Manager

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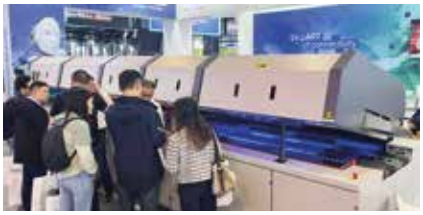

From global trade fairs to new locations, Rehm demonstrates international presence.

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Interview with Johannes Rehm to mark the company's 35th anniversary.

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Honouring long-standing employees at the summer celebration – including Wolfgang Zeifang.

CREATE YOUR Connections

From eight to three

What were once eight individual processes will now form three clearly structured core areas: Reflow Soldering, Drying & Curing, and Coating & Dispensing. The portfolio is complemented by a category for special systems and Line Solutions, which continue to provide scope for customised solutions. This creates greater clarity, reduces complexity, and offers our customers clear guidance. Diversity becomes clarity – without compromising on innovation, precision, or quality.

REHM REBRANDING
CREATE YOUR CONNECTIONS

With connections, we shape the future.

For decades, Rehm has stood for high-tech equipment for the production of electronics and industrial products. Our machines form the foundation for powerful, sustainable, and energy-efficient technologies used across a wide range of industries – from electronics manufacturing and medical technology to fuel cell production.

With our rebranding, we are creating greater clarity and a clear direction. Until now, our focus has been on eight individual processes – convection soldering, condensation soldering, contact soldering, inspection and testing, drying and curing, coating, special systems, and solar equipment.

From now on, we are consolidating this diversity into three clearly structured core areas: Reflow Soldering, Drying & Curing, and Coating & Dispensing. These are complemented by an additional category for special systems, which will continue to provide space for individual and tailor-made solutions. In addition, we are increasingly focusing on complete production lines from Rehm, offering everything from concept development to on-site installation – all from a single source.

This approach reduces complexity, creates greater transparency, and provides our customers with a solid foundation that fosters security, builds trust, and paves the way for even more efficient production processes. At the same time, we are strengthening our brand identity – making it globally clear, recognisable, and valuable.

Our vision is to actively shape the future of mechanical engineering – through innovative, reliable, and sustainable solutions that connect people, companies, and markets. Our mission brings this vision to life: with leading technology, utmost precision, and uncompromising quality, we develop machines and systems that help our customers work more efficiently and successfully. Through worldwide service and genuine partnership, we ensure long-term success and sustainable progress.

We are committed to operating sustainably, continuously opening up new markets, and creating a stable yet inspiring working environment that secures our shared success well into the future. Because only in this way can we continue to grow – as a company, as partners, and as a team.

Appreciation, honesty, enthusiasm, respect, courage, and strength are the values that not only shape how we work together, but also define how we develop our products, support our customers, and drive innovation forward.

CREATE YOUR Connections.

35 YEARS
REHM THERMAL SYSTEMS

For 35 years, Rehm has stood for innovation, precision, and reliability in mechanical engineering. We are taking this anniversary as an opportunity to present our new brand identity. With a fresh look, a clear structure, and a strong rebranding, we are opening a new chapter in our company's history. We will showcase this new appearance for the first time at productronica in Munich – the place where the future of electronics manufacturing is shaped.

WELCOME TO THE PRODUCTRONICA 2025

New trade fair concept with networked systems and communication areas that offer more than just virtual connections.

Under the guiding principle “Create your Connections”, Rehm Thermal Systems presents a holistic trade fair concept that seamlessly links people, technology, and knowledge. The booth combines space for personal interaction, innovative technologies, and digital experiences – creating a platform where customers, partners, and visitors can forge new connections and strengthen existing networks.

The new form of communication – ViCON AiDe

A particular highlight of Rehm’s trade fair appearance is ViCON AiDe, which is integrated into all VisionXP+ systems as well as the Protecto series, and serves as a digital assistant supporting operators directly at the machine. It provides instant answers to questions about soldering technology, system operation, or troubleshooting – precisely tailored to the systems installed at the customer’s site.

The intelligence of this AI assistant is built on the collective knowledge gained from 35 years of Rehm experience. It draws on an extensive knowledge base, technical documentation, service topics, and practical insights from Rehm’s global network. Thanks to this unique data foundation, ViCON AiDe can respond accurately and in context – whether the query concerns process steps, maintenance recommendations, or optimisation suggestions.

The result: downtime is significantly reduced, system operation becomes easier, and process reliability and manufacturing efficiency are sustainably improved. ViCON AiDe thus becomes the digital link between people, machines, and knowledge – marking another step towards intelligent, self-learning manufacturing.

1. Catering and Networking

The spacious hospitality area with its wood-inspired design forms the heart of the booth, providing a central space for personal conversations and networking. In this relaxed atmosphere, valuable connections are created – whether over a cup of coffee or during in-depth project discussions. Open seating areas and a modern counter encourage dialogue and invite visitors to explore ideas further and strengthen partnerships.

2. Exhibition area

The exhibition area focuses on Rehm's latest systems, including the Vision and CondensoX units as well as the RDS and Protecto portfolios. Visitors can not only view the systems but also explore their functionality through direct interaction with our experts. Thanks to interactive consultations and practical demonstrations, technical innovations become tangible – including the seamless networking of the systems.

3. Information area

The central area is dedicated entirely to the future of manufacturing: here, we showcase the intelligent networking of our systems via ViCON and the integration of Hermes and CFX through our subsidiary Resitco. In addition, the Rehm Academy offers insights into training and development opportunities where expertise and digitalisation go hand in hand – a meeting point for everyone shaping Industry 4.0.

4. VR Showcase

The VR Showcase offers a fascinating glimpse inside our soldering systems. Through virtual reality, processes that are normally hidden become visible – from heat transfer to line integration. Visitors can experience full-scale production lines virtually, explore process parameters, and interact with innovative solutions before they become reality.

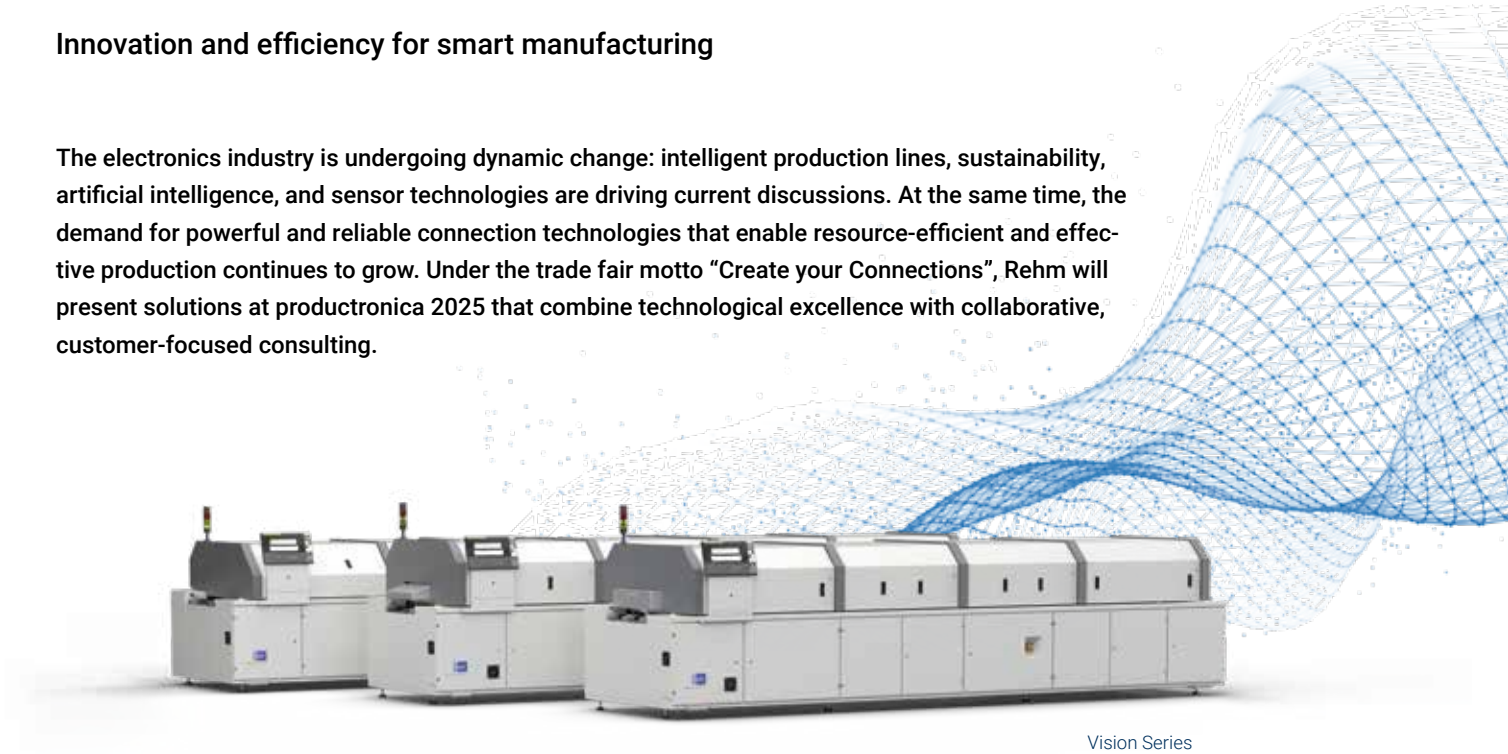
The hospitality area with its wood-inspired design forms the heart of the booth, providing a central space for personal conversations and exchange.

The central area focuses on ViCON, our subsidiary RESITCO, and the Rehm Academy.

EXPERIENCE OUR TRADE FAIR SYSTEMS

Innovation and efficiency for smart manufacturing

The electronics industry is undergoing dynamic change: intelligent production lines, sustainability, artificial intelligence, and sensor technologies are driving current discussions. At the same time, the demand for powerful and reliable connection technologies that enable resource-efficient and effective production continues to grow. Under the trade fair motto "Create your Connections", Rehm will present solutions at productronica 2025 that combine technological excellence with collaborative, customer-focused consulting.



Vision Series

Vision Series | Power that connects

At the centre of Rehm's trade fair presentation is the Vision Series – Rehm's high-performance platform for energy-efficient and precise convection soldering. The new VisionXP+ and VisionXP+ VAC set new standards in terms of energy savings, process stability, and sustainability. Thanks to integrated EC fan motors, optimised gas management, and the intelligent ProMetrics software solution, temperature profiles are maintained with precision while resources are used efficiently. A special feature of the VisionXP+ is the patented mechatronic curtain at the inlet and outlet, which reduces nitrogen consumption by up to 20 %. The VAC version, with its integrated vacuum chamber, also offers the option of formic acid soldering, enabling flux-free, void-free, and exceptionally clean solder joints. The series is completed by the VisionXC, which, with its compact design and smart features, fits seamlessly into any production environment. With a new VR showcase at the booth, Rehm demonstrates the optimised gas management system, allowing visitors to experience the process innovations of the Vision Series in an interactive and immersive way.

Condenso Series | Quality without compromise

With the CondensoX-Line FA, Rehm demonstrates the advantages of resource-efficient vapour phase soldering. Equipped with a closed-loop system, the medium Galden® is almost completely recovered, reducing operating costs and conserving resources. The combination with formic acid technology enables flux-free and void-free solder joints, which are particularly important for the demanding requirements of power electronics. A special highlight: the CondensoX-Line with Formic Acid has been submitted for the prestigious productronica Innovation Award 2025 – yet another testament to Rehm Thermal Systems' innovative strength and pioneering role.

CondensoX-Line FA

Nexus | Shaping the electronics of the future

The Nexus contact soldering system sets new standards in advanced packaging and power electronics. It ensures void-free results through reflow processes using contact heat under vacuum, making it ideal for soldering demanding components such as IGBTs on DCB substrates.
The integrated bubbler system, which uses formic acid as an activation medium, guarantees optimum wetting and clean solder joints. With operating temperatures of up to 400 °C (optionally 450 °C) and the largest working area on the market, the Nexus meets even the highest requirements for flexibility and cost efficiency.

Nexus

Protecto Series | Safety meets innovation

Rehm also demonstrates innovation in the field of coating and dispensing. The ProtectoXP and ProtectoXC systems combine maximum process reliability with user-friendly operation. An integrated height sensor with Z-axis control automatically compensates for uneven surfaces on assemblies, ensuring consistent results even with complex geometries. Thanks to the intuitive ViCON software, programs can be created quickly and efficiently, with 2D programming automatically converted into 3D. This allows even the most demanding coating and dispensing tasks to be carried out precisely and seamlessly integrated into modern production line concepts.

A particular highlight is the new Hurricane valve, which offers maximum flexibility by combining jetting, dispensing, and spraying in a single unit. While conventional curtain coating typically ends at around 100 mPas, the Hurricane valve enables spraying of materials with viscosities between 500 and 3500 mPas – ideal for rapid, uniform coating of larger surfaces. It can be switched to a fully functional spray mode without retooling, delivering a clean coating pattern with no overspray. As a result, short cycle times, efficient coating of large areas, and precise selective structures are achieved – perfectly suited to the flexible demands of modern manufacturing.

RDS UV LED | Efficiency in seconds

Rehm is also presenting the newly developed RDS UV LED, a system designed for efficient and process-secure curing of materials. With its minimal footprint, the system enables short cycle times and therefore exceptionally high throughput. The combination of compact design, energy efficiency, and process reliability makes the RDS UV LED an ideal solution for modern production environments.

Line Solutions | Intelligently connected

Beyond individual systems, Rehm will appear at productronica as a provider of complete production lines. The focus is no longer solely on the machine itself, but on the intelligent networking of all systems and their seamless integration into higher-level MES structures. With standardised interfaces such as Hermes and CFX, Rehm ensures that its equipment can be easily integrated into smart factory concepts. This results in holistic solutions that offer the highest process reliability and sustainably increase efficiency in electronics manufacturing. Rehm provides complete production lines from a single source – from concept and planning to on-site installation at the customer's facility.

ProtectoXP RDS UV LED

CHALLENGES AND STRATEGIES AT HANNUSCH

Cooperation and maximum integration for production reliability and efficiency at Hannusch Industrieelektronik GmbH

Hannusch Industrieelektronik

For almost 40 years, the electronics manufacturing service provider Hannusch Industrieelektronik GmbH from Laichingen has been successfully specialising in custom processes for PCB assembly and electronic module production. With new strategies, technologies, and projects, the company is preparing to meet the increasing demands of the future.

Currently, Hannusch Industrieelektronik GmbH employs around 60 people across 4,000 square metres, producing high-quality industrial electronics, systems, and special-purpose machines. The average batch size for its 165 customers follows a "High Mix, Low Volume" model, typically between 150 and 1,000 units. Due to cost pressures, developments in the EMS market, and decreasing batch sizes, this production model is particularly demanding and requires a high level of flexibility. To face these challenges, the company is implementing new strategies, technologies, and projects to position itself for the future.

Alongside the targeted expansion of customer services and client base – for example in the medical sector – Hannusch is placing strong emphasis on energy efficiency, reproducibility, and further digitalisation. To ensure future-proof productivity and standardisation, the production lines have recently been expanded with additional Rehm systems. In addition to a Rehm ProtectoXP for optimal coating of high-grade electronics, a Rehm CondensoXM Smart condensation soldering system, and a VisionXP reflow soldering system, a new VisionXP+ is now also in use. This marks an important step towards standardising production. Today, 80 % of all PCBs at Hannusch are already processed using Rehm systems.

Coating processes for high-end electronics

With increasing demand for dispensing and coating processes, Hannusch has expanded its conformal coating capacities. The ProtectoXP protects electronic assemblies from harsh environmental influences such as humidity, corrosion, chemicals, dust, or vibration. Depending on the customer's project, printed circuit boards are coated – sometimes selectively – after the soldering process. The Rehm system has been combined with a lacquer dryer to ensure the best possible process quality and functionality of electronic assemblies, which are used in e-bike and automotive applications, medical technology, and aerospace industries.

Production optimisation and holistic process automation have been implemented with the Protecto line.

Hannusch also relies on Rehm systems for vapour phase soldering – in this case, the inline-capable CondensoXM Smart.

Managing Director Michael Hannusch is pursuing a Single Source Manufacturing strategy, which not only enables future standardisation of production, but also delivers significant energy savings. Through this strategic orientation, the company opens up new opportunities for greater reproducibility and production efficiency. Key components of Hannusch's technology roadmap and strategy include horizontal networking capabilities, offline system control, and improved data integration with the ERP manufacturing system.

Hermes interface communication and production line monitoring

"The Hermes Standard" is the successor to the SMEMA interface, and can be combined with the IPC-CFX standard. Hermes ensures that essential PCB data is transferred reliably, easily, and completely from machine to machine. These Hermes data can then be further used in communication with the ERP system.

With Rehm's ViCON Connect control tool, systems can be prepared more easily and even offline, while allowing horizontal machine control across the line. At Hannusch, additional machines are now being networked and the collected data is being used more extensively. This gives the Hannusch team a clearer overview of production, enabling processes to be monitored and controlled remotely, without long walking distances or direct on-machine operation. Even VNC or VPN connections allow access to the systems. As a result, simpler process preparation, faster response to alarms, and quick troubleshooting significantly increase production efficiency.

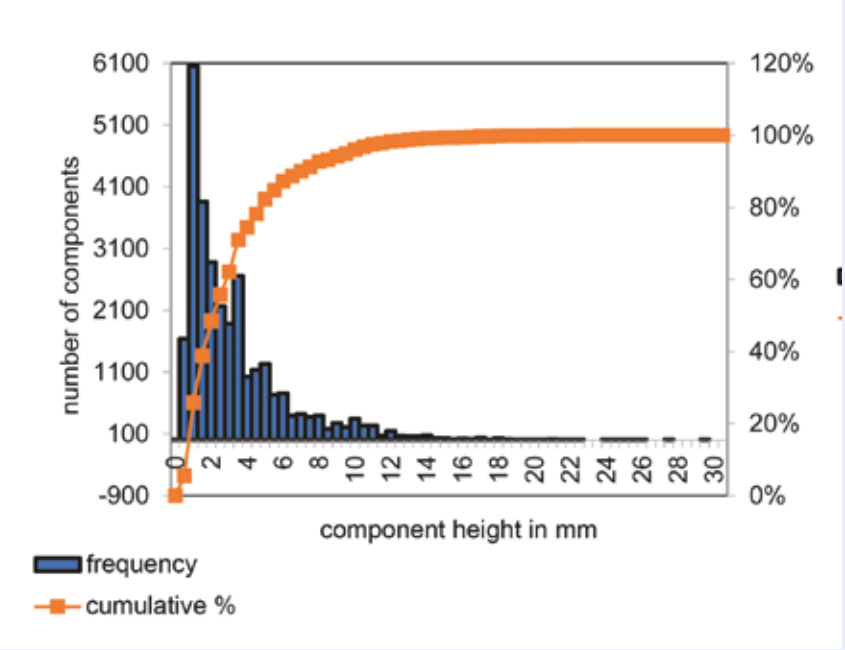
In future, production processes will be monitored and controlled without long walking distances or direct operation at the machine.

Energy and nitrogen savings – the "EcoMode"

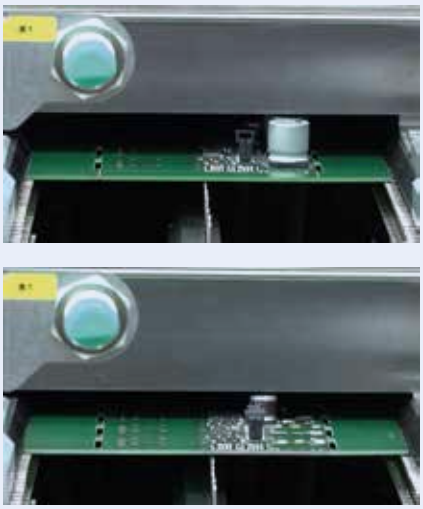
The energy savings achieved in the soldering process at Hannusch Industrieelektronik – over 30 % – are remarkable. Thanks to the optimised insulation of the ovens, the result is even noticeable in an almost neutral ambient temperature. The introduction of Rehm's new generation of systems has also extended the cleaning cycle to six months. By heating the ovens more quickly after night-time shutdowns and using Rehm's patented mechatronic curtain, Hannusch's internal analyses show nitrogen savings of more than 50 % for certain assemblies.

In electronics manufacturing, differences in component heights require variable conveyor clearance in convection soldering systems. The increasing diversity of component geometries poses a challenge, as higher clearances demand more nitrogen for process inertisation. Rehm Thermal Systems' patented mechatronic curtain addresses this issue effectively: it automatically adjusts to the specific assembly height based on program settings, maintaining an optimal distance from the PCB. As a result, less heat and nitrogen escape from the system, leading to a significant reduction in both energy and nitrogen losses.

To further enhance these savings, Hannusch Industrieelektronik plans to extend production times, thereby maximising the energy reduction achieved through the EcoMode.



Distribution of component height from a product mix.



Automatic adjustment of the upper and lower curtain to different assembly heights.

"Our expectations in terms of quality, capabilities, and productivity have been fully met with our investments in Rehm equipment," says Michael Hannusch. "And with our climate-neutral power generation project, we are definitely heading in the right direction with our energy efficiency and environmental strategy."

Currently, the company produces eco-friendly electricity with its own 83,000 kWh photovoltaic system, and additional solar modules are already in the planning phase.

Partnership with Rehm and joint development projects

The cooperation and partnership with Rehm Thermal Systems, which has existed since 2007, continues to grow in strength. Today, Rehm technicians can already access the systems remotely. The two companies are currently testing the implementation of the Hermes Standard at the Laichingen site. To analyse real production data and advance forward-looking development projects, Rehm's engineers regularly work on-site with the Hannusch team.

Michael Hanke, Global Sales Director of the Rehm Group, expresses great satisfaction with this close collaboration: "It's not just the geographical proximity and the friendly working relationship, but also our shared company philosophies that form the foundation of this key partnership. Our joint successes so far prove us right."

Michael Hanke, Global Sales Director at Rehm Thermal Systems, and Managing Director Michael Hannusch are pleased about the successful cooperation. In the background: a VisionXP+ featuring an extended cooling zone and pyrolysis technology.

However, neither company intends to stand still. The pace of technological development in the electronics industry and the increasing market pressure continue to accelerate.

"To remain competitive and future-ready," explains Michael Hannusch, "we will focus on expanding data exchange between systems, implementing closed-loop processes to optimise production, and pursuing holistic process automation – perhaps even with the help of AI. Flexible adaptability and close cooperation with key partners will remain crucial competitive advantages in the years to come."

INNOVATIVE SOLUTIONS FOR SUSTAINABLE ENERGY SUPPLY

Component manufacturing for fuel cells and electrolysis cells

The transition towards a climate-neutral energy supply requires the expansion of renewable energy sources. In this process, the use of hydrogen is becoming increasingly important, calling for technological solutions from industry. Rehm Thermal Systems is contributing to this transformation on multiple levels.

Assemblies & Systems

In the field of power electronics, vapour phase soldering under vacuum has become established as a process-secure technology – for example, for modules in inverters or charging stations. By limiting the soldering temperature, temperature-sensitive components are protected. At the same time, the vacuum technology of the Condenso systems enables large-area solder joints with minimal void content, ensuring optimal thermal coupling and thereby increasing the service life of the assembly.

By expanding its product portfolio, Rehm Thermal Systems is making an additional contribution to the development of hydrogen infrastructure in support of an independent European energy supply. With core competencies across a temperature range from -40 °C to 1200 °C, the company offers systems for material application as well as thermal production solutions for electrolyser and fuel cell components – scalable and highly automated. This field of application is closely linked to power electronics, particularly through comparable requirements for electrical system integration and process engineering.

Fuel and Electrolyser Cell Types

There are various types of electrochemical cells, the most common being PEM cells (Proton Exchange Membrane) and SO cells (Solid Oxide). Both can operate as fuel cells or electrolysers. In electrolysis, electrical energy is used to split water into hydrogen and oxygen, while in a fuel cell, the reverse process takes place. The reaction of hydrogen and oxygen into water, releasing electrical energy, occurs at the membrane of the fuel cell. The two cell types differ in their operating temperature, which defines their respective areas of application: PEM cells operate at 60–80 °C and are mainly used in mobile applications, whereas SO cells operate at 600–1000 °C and are primarily employed in stationary systems.

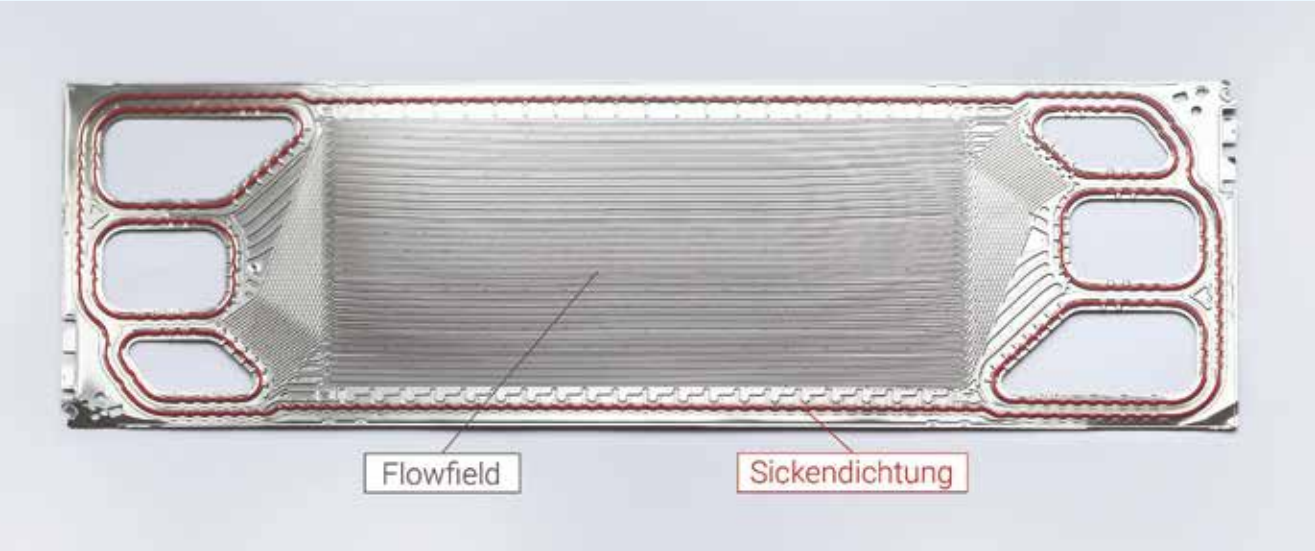


Fig. 1: ZSW HyFaB generic stack – metallic PEM bipolar plate manufactured by EKPO.

Structure and components of the cells

In PEM fuel cells, the bipolar plate (BPP) plays a central role: it channels the reaction gases, conducts electricity, and connects the cell poles. In solid oxide fuel cells (SOFCs), an interconnect plate (ICP) is used instead. It provides the electrical connection between the cells and ensures the distribution of gases. Both plate types must meet stringent requirements for electrical conductivity, gas tightness, and thermal stability. To guarantee these properties, they receive specific functional coatings. Likewise, the membrane—polymer-based in PEM cells and ceramic in SOFCs—is also functionally coated. Each coating process is followed by a precisely defined thermal production step to ensure the functionality and durability of the layers.

A BPP consists of two embossed metal halves that are welded together. The bead around the outer edge of the plate forms a contoured seat for the seal and provides a defined spring effect (see Fig. 1). This design ensures that the sealing function remains reliable even under thermal and mechanical stress. The seals separate media, provide mechanical stability, and prevent the uncontrolled ingress of foreign particles into the cell as well as the escape of reaction products.

The sealing material in PEM cells is typically made of silicones or elastomers. Since SO cells operate at significantly higher temperatures, a glass paste is used for sealing, which softens at elevated temperatures and forms a tight bond between the components. Unlike the BPP, the ICP is not composed of two embossed halves but rather a solid steel component designed to withstand higher operating temperatures.

The integrated flow field of the plates is an embossed channel pattern that distributes the gases evenly across the cell surface and allows for the removal of water and heat (see Fig. 1). In metallic BPPs, this surface is coated to prevent corrosion, ensure mechanical stability, and maintain electrical conductivity. In contrast, graphite BPPs generally do not require such coatings, as graphite naturally provides these properties. Because ICP plates are made exclusively from ferritic steel, they receive a Mixed Conducting Oxide (MCO) coating to prevent chromium from the steel from coming into contact with the cell. Additionally, both the ceramic membrane in SO cells and the membrane electrode assembly (MEA) in PEM cells are coated to enhance conductivity and reactivity.

Stack manufacturing

After the BPP or ICP has been cut, embossed, and cleaned, the flow field is coated. In PEM cells, this is done selectively using roller coating or dispensing, or over the entire surface using PVD (Physical Vapour Deposition). For SO cells, the MCO coating of the ICP is typically applied via PVD or plasma spraying. In addition, a seal is applied in each case – for PEM cells using screen printing, dispensing, or injection moulding, and for SO cells usually via screen printing or, in some cases, dispensing.

The dispensing process offers a high degree of flexibility for different materials, as well as precision and repeatability, while preventing air bubble formation in the material. This process is represented in Rehm's portfolio by the Protecto systems. Both printing and dispensing processes require subsequent thermal treatment to ensure curing and adhesion quality.

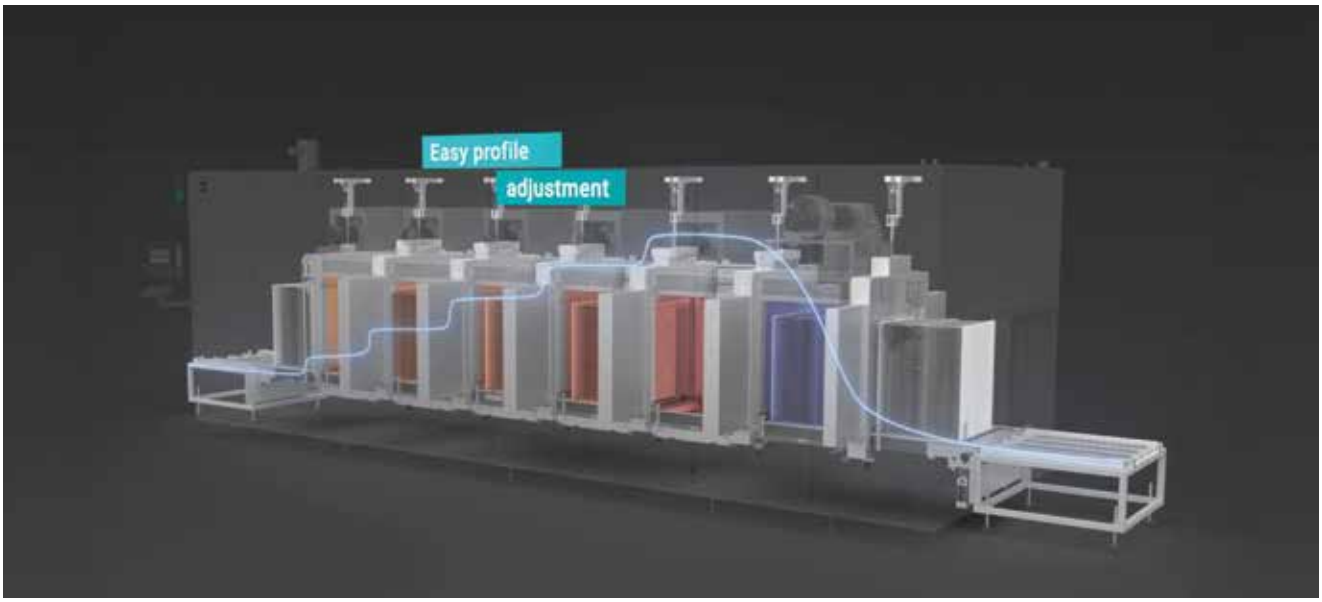


Fig. 2: Magazine dryer with stepped profile for the production of BPP and ICP.

After the material application, the plates are automatically handled in magazines or stacked carriers and fed into the thermal system. For PEM BPPs, drying first takes place at 80–100 °C to remove solvents from the material and prevent bubble formation in the seal. The sealing compound is then vulcanised at 170–200 °C to achieve complete chemical cross-linking. This thermal process is implemented as a multi-step temperature profile within a continuous process. In injection moulding, an additional post-curing process at up to 180 °C may also be required to optimise quality.

For processing BPPs and ICPs, convection magazine dryers are particularly suitable. These systems provide optimal zone separation through partitions and enable precise replication of stepped temperature profiles (see Fig. 2). The magazines or stacked carriers can hold hundreds of plates, allowing high-volume production with cycle times of just a few seconds per plate.

In industrial series production, high precision is also required when coating ceramic membranes, where screen printing is the dominant method. Functional layers are applied squentially, followed by drying at 80–180 °C and sintering at 900–1600 °C to achieve the desired functional cell structure. Ceramic membranes require higher temperature gradients, so systems combining infrared radiation with convection are used. The sensitive 20 µm-thin substrates are transported on stabilising mesh belts made of stainless steel or Teflon. After passing quality inspection, the cells are assembled to achieve the desired overall performance. The final step involves mechanically connecting the cells with terminal plates by screwing or clamping, ensuring a tight and stable stack.

Process scalability

To make modern production lines more efficient, Rehm manufactures automated systems that ensure highly repeatable manufacturing. The company's thermal systems are flexibly scalable and are custom-designed according to specific material requirements and production volumes. They comply with DIN EN 1539 standards and, thanks to separate cooling zones, are more energy-efficient than traditional batch ovens.

While greenfield projects typically offer sufficient floor space, existing production facilities (brownfield environments) often face the challenge of integrating new lines within limited space. Depending on the temperature profile, the length of thermal systems can vary. To address spatial constraints, Rehm also offers systems with vertical product flow, reducing the footprint by a factor of ten.

Working closely with partners, Rehm develops customised line concepts featuring varying degrees of automation and traceability options. Even during the development and prototyping phase, the company's Technology Center is available to determine optimal process parameters, ensuring efficiency and precision from the very start.

Conclusion

To meet the growing demands of hydrogen-based energy systems, powerful and adaptable manufacturing processes are essential. Rehm Thermal Systems relies not only on proven technologies but also develops tailor-made solutions to address these evolving needs. With an eye on increasing production volumes, new cell concepts, and higher levels of automation, the company provides a strong technological foundation – both today and in the future.

Further information at www.electronicsontheroad.com

INNOVATIVE EVENT SERIES FOR ELECTRONICS MANUFACTURING

„Electronics on the Road“

The new event series Electronics on the Road, organised by the ASYS Group, ASMPT, and Rehm Thermal Systems, has been offering practical insights into the latest developments in electronics manufacturing since January 2025.

Opening in Hamburg

The series kicked off on 29–30 January 2025 in Hamburg with a high-profile programme of expert presentations and networking opportunities. The agenda included contributions such as:

› **Stefan Wespel** (Diehl AKO Stiftung & Co. KG) – Networked production in small and medium series

› **Dr. Johannes Adam** (Easylogix GmbH) – Digital reflow simulation of PCB assemblies

› **Michael Hannusch** (Hannusch Industrieelektronik GmbH) – Hermes line solutions in high-mix/low-volume environments

› **Christian Albinger** (BMK Group GmbH & Co. KG) – Testing methods in electronics production

A special highlight:

On the evening before the event, a Science Slam offered an entertaining introduction to the world of science, combined with conversations about electronics manufacturing.

Tour through other German cities

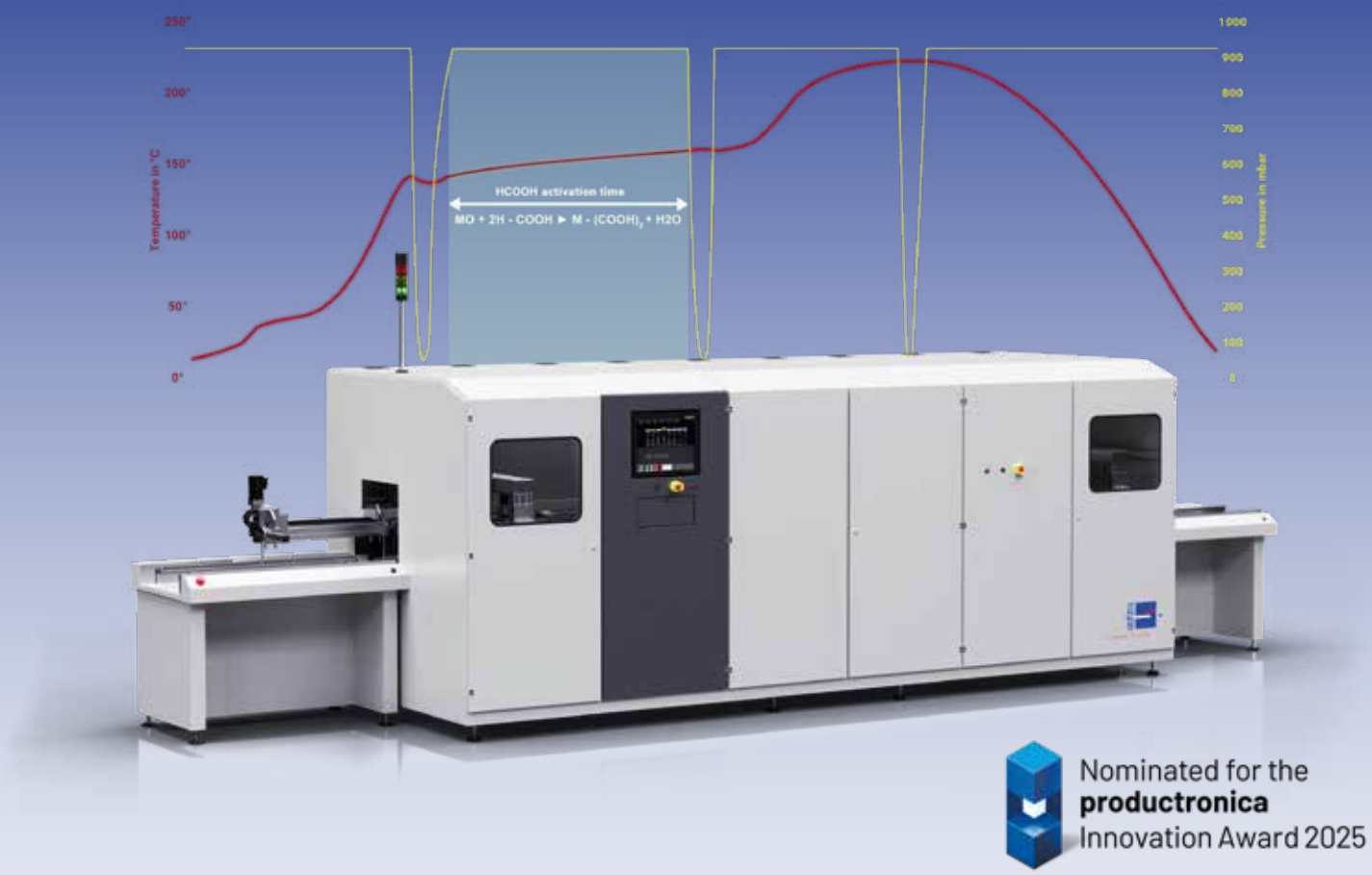
Over the course of 2025, the tour continued to Düsseldorf, Karlsruhe and Dresden – in line with the motto “We bring knowledge to you.” The final event took place in Dresden on 24 and 25 September 2025, where visitors could once again look forward to an exciting lecture programme and diverse networking opportunities.

Event character and target group

Electronics on the Road is aimed specifically at professionals in electronics manufacturing, process managers and interested industry players who want to learn about current trends and technological innovations. The mix of expert presentations and interactive formats such as the Science Slam creates a stimulating exchange.

Outlook for 2026

The event series continues. Meet us in 2026 in Cologne, Lindau, Heidelberg, Salzburg and Berlin.



EFFICIENT SOLDERING – COMPLETELY WITHOUT FLUX

32 years of experience, three processes, one goal: optimum wetting and residue-free results

The use of formic acid as a reducing agent in reflow soldering processes has a long, though initially selective, history at Rehm. In 1993, several infrared (IR) and convection soldering systems with a formic acid function were delivered to customers such as Bosch in Wolfenbüttel and Motometer in Leonberg. These early systems explored innovative approaches to sensor soldering, which, however, did not reach full series maturity at that time.

During the 1990s, the industry's focus was clearly on lead-free soldering under nitrogen atmosphere, and the use of formic acid remained limited to project-specific applications. It was not until the rising demand for flux-free processes, aiming to prevent void formation in solder joints and to eliminate post-cleaning steps, that the full potential of this technology began to be strategically harnessed for modern electronics manufacturing.

A key milestone came in 2014 with the delivery of a CondensoXS condensation soldering system with formic acid integration to the Fraunhofer IZM in Berlin – marking the first step toward incorporating acid technology into vapour phase processes. In 2018, several Nexus contact soldering systems followed, using formic acid specifically for flux-free soldering of demanding assemblies.

Today, in 2025, Rehm Thermal Systems is the world's only manufacturer to offer formic acid technology across all three industrial reflow soldering methods: convection, condensation, and contact soldering. This opens up new possibilities for flux-free soldering processes, offering an additional benefit of eliminating the need for subsequent cleaning.

Figure 1 a–c: Soldering processes with formic acid by Rehm Thermal Systems

Process fundamentals and advantages of soldering with formic acid

Flux in solder pastes, while beneficial, also brings certain drawbacks. It removes oxides and protects surfaces from reoxidation, but unprepared surfaces lead to poor wetting and inhibit the formation of intermetallic phases. Unfortunately, volatile flux components contribute to void formation, while non-volatile residues remain on the assembly and must be cleaned off to prevent electrochemical migration or signal degradation in high-frequency electronics.

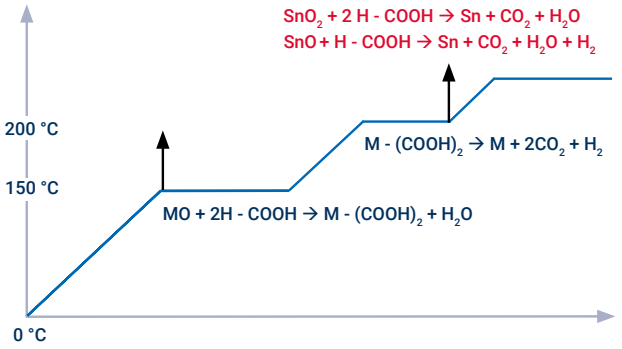


Figure 2: Schematic representation of the two-step deoxidation process with formic acid, showing the reaction as a function of temperature.

Formic acid removes metal oxides through a two-step process. In the first phase, at temperatures above 150 °C, metal formates are formed during activation. The activation time is a key parameter in this phase. In the second phase, starting at around 200 °C, these formates thermally decompose (e.g. in copper) or reduce the oxides to pure metals (e.g. tin and silver oxides). The process releases reducing gases such as carbon monoxide and hydrogen, which further promote oxide reduction. Additionally, the molten solder in this reducing atmosphere supports optimal wetting, creating an oxide-free, well-wettable surface on copper and other metals.
Unlike traditional fluxes, which leave residues and require post-cleaning, formic acid decomposes completely into gaseous products (CO_2, CO, H_2O), resulting in clean solder joints without residues.

Typical applications include:

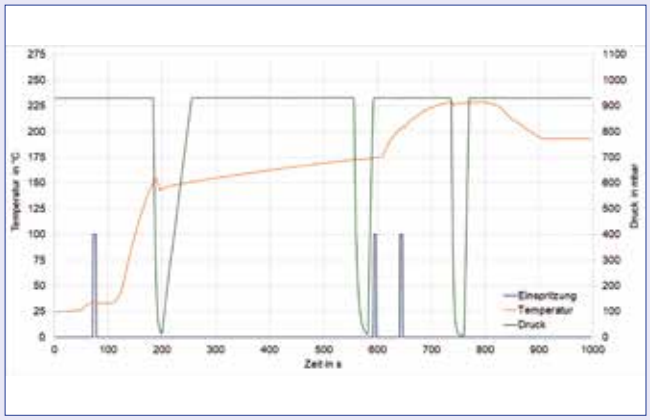
- **Power electronics modules (IGBTs, MOSFETs)**
- **LED and optoelectronic modules (sensors, cameras)**
- **High-frequency electronics (radar, satellite technology)**
- **Wafer bumping and BGA reflow soldering**

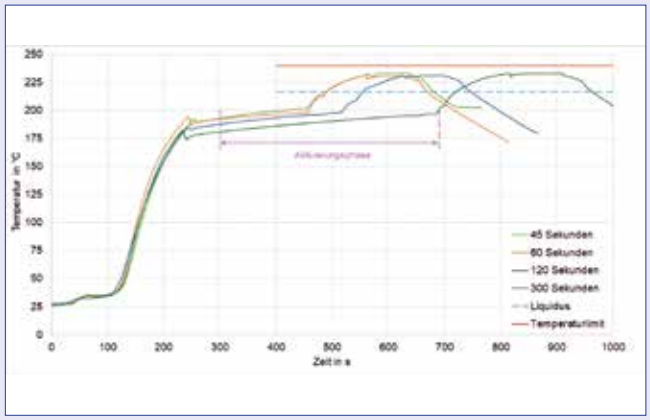
Using the example of the combination of vapour phase soldering and formic acid, which is increasingly applied in the soldering of IGBTs onto heat sinks, the following section explains the process control and the specific characteristics of this combination.

Void-free and flux-free soldering of IGBTs on cooling plates

The increasing use of inverters, particularly those with IGBT power semiconductors mounted directly on cooling plates, reflects the growing importance of energy efficiency. Inverters enable precise, speed-controlled operation of electric drives, significantly reducing energy consumption and operating costs while lowering emissions.

However, IGBTs generate considerable heat during operation. To prevent overheating and thermally induced failures, this heat must be dissipated quickly and uniformly through the cooling plate. Voids act as thermal insulators, creating hot spots that cause overheating and degradation of the solder structure. A void-free solder joint ensures homogeneous, large-area heat transfer, reducing temperature peaks in the semiconductor and increasing its service life and reliability.





Figures 3+4: Comparison of UV sources – mercury medium-pressure and UV LED emitters: total irradiation dose (right) and maximum process temperature (left) as a function of transport speed.

Process description

Vapour phase soldering, also known as condensation soldering, is an exceptionally gentle soldering process in which the assemblies to be soldered are heated by the condensation heat of a vaporised medium – typically Galden®. Since the maximum temperature is limited by the boiling point of the medium, overheating of sensitive components is prevented, making this method ideal for high-quality electronic assemblies used in medical technology, aerospace, and power electronics. Heat transfer occurs uniformly and is independent of geometry or component density, ensuring high process reliability. Particularly for very heavy products, vapour phase soldering remains the method of choice.

Figure 3 illustrates the time–temperature and time–pressure profile of a vapour phase soldering process using formic acid (HCOOH) for surface activation. The process is based on Rehm's patented injection principle, in which Galden® is precisely metered into the process chamber – visible as the blue peaks. This controlled injection enables a finely tuned heating and activation phase, during which HCOOH is introduced in parallel to reduce oxidised metal surfaces. Thanks to the precise control of pressure and temperature, defined temperature profiles can be implemented with high accuracy, ideally supporting the chemical reaction of the HCOOH activation and enabling the atmosphere change that makes this activation process possible in the first place.

The combination of uniform heat transfer and targeted oxide removal results in high-quality, void-free, and residue-free solder joints – even for complex assemblies with high component density and large thermal mass.

Influence of activation time

The activation time in the soldering process depends on the concentration of the formic acid vapour. Studies with various IGBTs and cooling plates have shown that surface condition and cleanliness also have a significant influence. To analyse these additional factors, Rehm developed a test methodology using dummy assemblies, designed with similar material composition and geometry to real components. Figure 4 shows the temperature profiles with activation times ranging from 45 to 300 seconds.

The results of the X-ray analyses shown in Figures 5a–d indicate a general trend: longer activation times lead to fewer voids in the solder layer. The measured void area ratios, including unbonded edge regions of the solder joint, range between 3–8%. Since the activation time directly affects cycle time, the optimal balance between void minimisation and throughput must be determined when profiling real assemblies. Furthermore, longer activation times are associated with higher nitrogen and formic acid consumption.

Soldering IGBTs on cooling plates with formic acid

Based on the relationship between activation time and process efficiency described above, the activation time for soldering real assemblies lies between 45 and 90 seconds, depending on the material quality, surface cleanliness, and the desired void limitation.

In the present example, conducted at Rehm, an IGBT with a contact area of 40 × 34 mm and a solder preform thickness of 300 µm was soldered onto a copper heat sink. The surfaces of both joining partners consisted of bare copper without any protective coatings. The process followed the sequence illustrated in Figure 3, and the activation time in this case was 60 seconds.

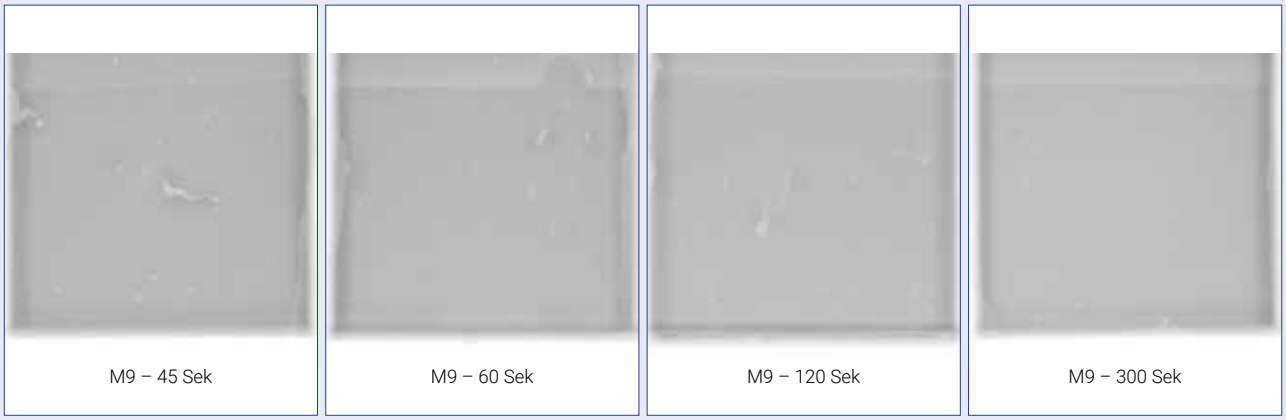


Figure 5 a–d: X-ray images of dummy solder joints for activation times ranging from 45 to 300 seconds.

The result of this soldering process, shown as an X-ray image in Figure 6, reveals an almost void-free connection, which has a highly positive effect on heat dissipation and, consequently, on the service life of the IGBT.

The cross-sections shown in Figure 7 additionally confirm that the solder layer thickness, depending on the measurement position, ranges between 287 and 340 µm, as expected. The intermetallic phase has a thickness of 2.2 to 3.1 µm, which corresponds to the typical range for soft soldering on copper surfaces.

Summary

Historically, Rehm Thermal Systems began integrating formic acid into its IR and convection soldering systems as early as 1993. A key milestone followed in 2014 with the delivery of a CondensoXS system to Fraunhofer IZM, which was then succeeded by the introduction of Nexus contact soldering systems from 2018 onward.

The studies presented confirm that vapour phase soldering with formic acid is a highly reliable technology for flux-free soldering. Especially in the case of large-area power semiconductors, such as IGBTs on copper coolers, it enables virtually void-free solder joints, improving heat dissipation and extending component lifetime.

With the ongoing trend toward lead-free and flux-free processes and the demand for highly reliable power electronic modules, the use of formic acid will continue to expand. Future developments will focus on even more precise process control, shorter cycle times, and the optimised consumption of nitrogen and formic acid. Significant opportunities are emerging particularly in the fields of e-mobility, renewable energy, and high-frequency electronics.

Figure 6: X-ray image of an IGBT on a cooling plate after the soldering process with a 60-second activation time and a 300 µm preform thickness.

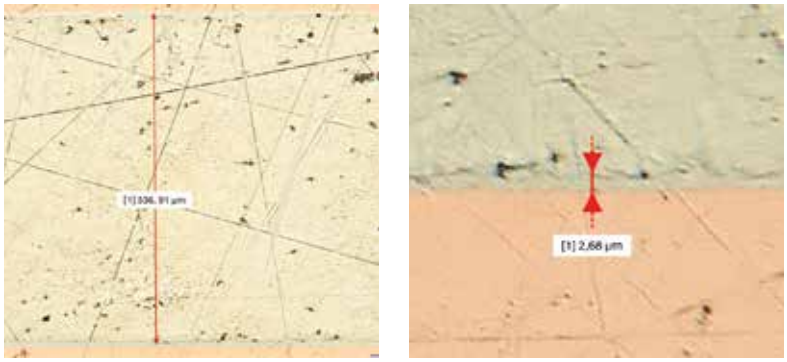


Figure 7 a,b: Solder layer thickness (left) and thickness of the intermetallic phase (right) after soldering an IGBT onto the cooling plate.

REHM THERMAL SYSTEMS INDIA
GRAND OPENING IN BANGALORE

Rehm expands its market position in India

Rehm Thermal Systems stands for quality, innovative technologies, and reliable service – worldwide. With a new subsidiary in India, we can now respond even faster to individual customer requirements and current market trends. Rehm Thermal Systems India, based in Bangalore, is therefore a direct response to the growing demand in the Indian market.

Driven by a strong domestic economy, rising demand from Southeast Asia, and government initiatives to reduce import dependency, India's electronics manufacturing sector is experiencing significant growth. In particular, the Indian automotive industry is benefiting from the shift towards electromobility, recording increasing production and sales figures in the field of electric vehicles. The Indian market for electric vehicles is expected to become the third largest in the world by 2030.

The management team in Bengaluru is now responsible for the support and consultation of Rehm's customers in India. In addition to sales and service, the new premises include a dedicated spare parts warehouse to provide customers with rapid and efficient support.

"Being innovative also means embracing progress and change. The electronics industry demands a high degree of flexibility to adapt to market dynamics," explains Sreekanth Krishnamurthy, Regional Sales Manager India.

The official opening ceremony took place on 24 October 2025. Among the invited guests were members of the Rehm India team, local government and institutional representatives, as well as delegates from Rehm Thermal Systems Dongguan, China, and the headquarters in Blaubeuren, Germany.

With the opening of the new site, Rehm celebrated another important milestone in its continued expansion in India.

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Ceremonial opening of Rehm Thermal Systems India with official representatives and a traditional supporting programme.

REHM TEAMS AT REGIONAL SPORTING EVENTS

At the start with enthusiasm, team spirit, and endurance

That team spirit and commitment are part of everyday life at Rehm Thermal Systems – not only at work but also on the sporting stage – has been impressively demonstrated by our employees in recent weeks. With great enthusiasm, energy, and motivation, they took part in several regional competitions, including the traditional Jo Cup, the lively AOK Run, and the demanding Xtreme Battle.

At every event, it was clear how much sporting ambition and shared experience go hand in hand: while some gave their all on the course, others provided extra motivation with cheering and support from the sidelines. After the competitions, there was celebration all around – focusing on achievement, perseverance, and the joy of movement. Many special moments were created that will be remembered for a long time to come.

Participation in these sporting events offers much more than just athletic challenges: it is a welcome opportunity to get to know colleagues better outside the usual work environment, make new connections, and strengthen the sense of togetherness within the company. The enthusiasm everyone showed once again underlines that we stand together as a team – far beyond the factory gates.

And the sporting journey was far from over: in September, the next highlight awaited with the Einstein Marathon. Numerous running enthusiasts from Rehm Thermal Systems lined up at the start – motivated by the unique atmosphere, team spirit, and shared sense of achievement. One thing is already certain: these events have once again strengthened our unity and created unforgettable moments.

REHM THERMAL SYSTEMS PRESENT WORLDWIDE

From global trade fairs to new locations such as Mexico, Rehm demonstrates how the company is shaping the future of electronics manufacturing.

IPC APEX EXPO, Anaheim USA.

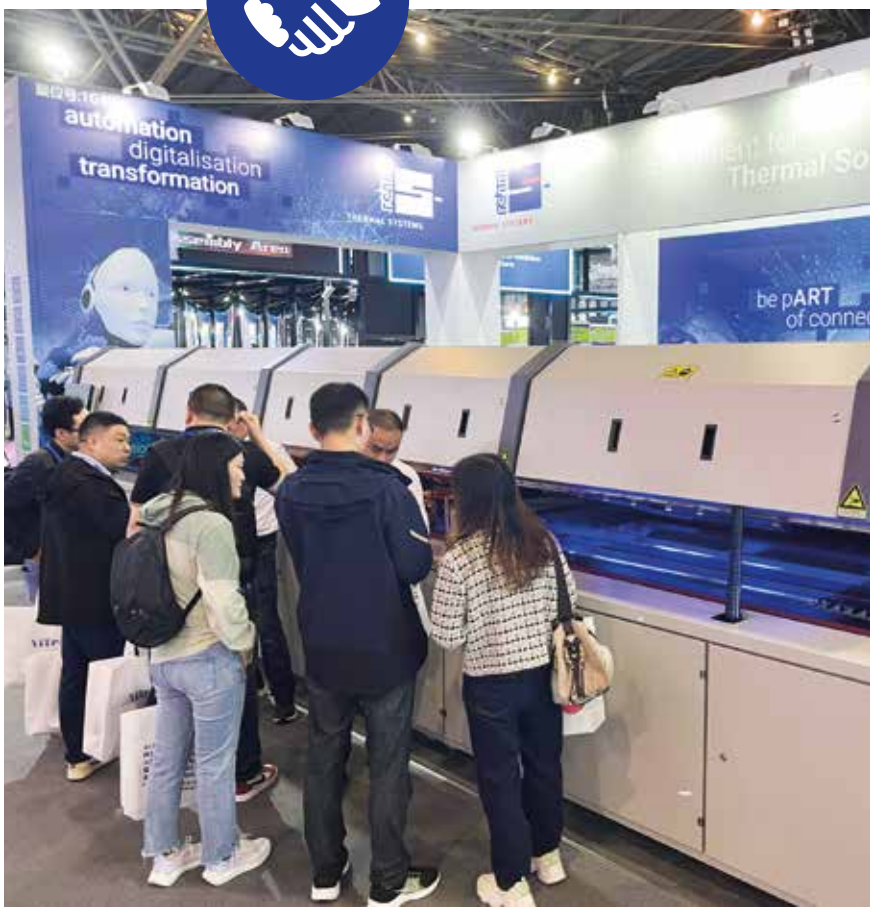
25th European Electronics Technology College, Colonia St. Jordi.

To mark its 35th anniversary, Rehm Thermal Systems is demonstrating how it continues to expand its leading role in mechanical engineering. With innovative manufacturing solutions, sustainable technologies, and a global presence, Rehm remains a reliable partner for customers on every continent. International trade fair appearances, strategic site expansions, and active industry engagement highlight the company's expertise and innovative strength – making it clear that Rehm is actively shaping the future of electronics manufacturing.

Rehm Thermal Systems is represented at all major international trade fairs, using these platforms to showcase the performance and versatility of its manufacturing systems to customers, partners, and interested visitors. In addition to productronica Shanghai, IPC APEX EXPO, and electronica/productronica India in Bengaluru, the company also participates in events such as SSPA Korea, Semicon South Asia, and Nepcon Shanghai. These appearances underscore Rehm's global reach, its ambition to enter new markets, and its commitment to presenting innovative manufacturing solutions to an international audience. At each exhibition, Rehm not only demonstrates its latest systems but also provides insights into technological developments, process optimisation, and sustainable solutions for electronics and industrial production.

Parallel to its exhibition activities, Rehm is driving international growth through the targeted expansion of its global sites. A particularly important milestone was the opening of the new company building in Guadalajara, Mexico, marking 10 years of Rehm's presence in the region. The site now offers state-of-the-art application areas and hosted a local Technology Day, where customers had the opportunity to experience the latest machines and processes up close, exchange ideas with experts, and gain insights into the company's high manufacturing depth and system quality. This location exemplifies how Rehm supports its international customers with local service, technical expertise, and high production flexibility.

Beyond its international expansion, Rehm also plays an active role in advancing the industry. The company co-organised the 25th EE-Kolleg, an event that provided professionals and executives with new impulses for electronics manufacturing. The platform focused on current trends,



SSPA Korea, Semicon South Asia, Nepcon Shanghai.

technological innovations, and solutions for energy-efficient and sustainable production processes. Rehm used the event to strengthen dialogue with customers, partners, and experts, share its know-how, and present practical, forward-looking approaches for the industry.

With this combination of global trade fair presence, targeted international growth, and active industry involvement, Rehm ensures that customers worldwide have access to innovative, energy-efficient, and reliable manufacturing solutions. At the same time, the company positions itself as a driving force that identifies trends, sets technological standards, and actively shapes the future of electronics manufacturing. The consistent blend of tradition, experience, and innovation makes Rehm Thermal Systems a trusted partner for companies across the globe.

Opening and Technology Day in Guadalajara, Mexico.

INTERVIEW

In conversation with Johannes Rehm

35 Years of Rehm Thermal Systems Pioneer in Mechanical Engineering, Innovation, Precision, and Global Presence

On the occasion of the company's 35th anniversary, Managing Director Johannes Rehm speaks about the company's development, technological innovations, and the new brand identity that will be presented for the first time at productronica in Munich.

Mr. Rehm, Rehm Thermal Systems is celebrating its 35th anniversary this year. How do you look back on this success story?

Johannes Rehm: We are very proud of the past 35 years. What began as a small company on the Swabian Alb has grown into a globally operating corporate group. Our headquarters in Blaubeuren now coordinates 27 representations in 24 countries. With over 600 employees within the Rehm Group – including our subsidiary Rehm BlechTec – we play a key international role in electronics and photovoltaic manufacturing.

How has the company developed over the years?

J.R.: From a garage to a global corporate group – it has been an exciting journey. As early as 2008, we opened our second production site in Dongguan, China, which now supplies international markets with more than 220 employees. In addition, we have strategically established subsidiaries such as Rehm BlechTec and are continuously expanding our production capacities. These investments clearly demonstrate our commitment to Germany as a business location.

1. Company building
2. Protecto line
3. Grand Opening – China
4. Training at the Rehm Academy
5. Thomas Hack in front of the construction site for the new extension

What is currently driving the electronics manufacturing industry?

J.R.: The industry is undergoing fundamental change. A shortage of skilled workers, rising operating costs, new regulations, and increasing complexity are making flexible line solutions and smart factory concepts more important than ever. Our response is targeted advancement – for example, through the founding of RESITCO GmbH, which allows us to strategically expand our expertise in automation and line configuration.

What technological advancements has Rehm implemented in recent years?

J.R.: Energy efficiency has become an increasingly important focus. Technologies such as pyrolysis, improved oven insulation, and our patented mechatronic curtain have significantly reduced energy and nitrogen consumption in our reflow processes. In addition, we are focusing on innovations in the coating and drying sectors, as well as on UV LED technology, which is both more efficient and longer-lasting.

What innovations have been made in soldering processes and vacuum technology?

J.R.: Flux-free soldering with formic acid is becoming increasingly important – not only for environmental reasons but also because it enables better solder joints and lower costs. Another highlight is our preform technology under vacuum, which allows for exceptionally precise solder joints, especially in large assemblies.

How is Rehm addressing digitalisation and connectivity?

J.R.: Digital transformation is a key focus for us. Through integration with MES systems, the implementation of the Hermes standard, and tools such as ViCON Connect, we are increasing transparency and efficiency in production. At productronica 2025 in Munich, we will be presenting for the first time a new AI-supported knowledge system that provides users with up-to-date information and direct access to training resources.

What significance does the Rehm Academy have for your company?

J.R.: With the Rehm Academy, we have established a state-of-the-art training centre. Across 1,000 square metres, employees, distributors, and service teams can gain hands-on experience – covering everything from soldering processes and quality assurance to software-related topics. For 2026, we are already planning the next edition of our Technology Days, which will serve as a platform for exchange, workshops, and expert presentations.

What does the anniversary mean for Rehm Thermal Systems?

J.R.: The 35th anniversary is a milestone that we celebrate with great pride, but it is also an opportunity to look ahead. Technological advancement, sustainable growth, and a strong team form the foundation of our success. We are also using this anniversary to present our rebranding with a new look – for the first time at productronica in Munich. All I can say is: it's worth a visit, not only because of our systems but because of the people behind them.

SUMMER FESTIVAL WITH DELICIOUS BARBEQUE

Current insights, honours for long-serving employees, and great spirits

Unfortunately, the weather wasn't on our side for this year's summer festival – rain threatened to spoil the fun. But thanks to some quick improvisation, our production hall was swiftly transformed into an event location, providing the perfect setting for the celebration.

The event began with an information session, where employees gained insights into current figures, ongoing projects, and internal company developments. Before everyone headed to the always delicious grill buffet, there was a special ceremony honouring long-serving colleagues.

A particular highlight was the recognition of Wolfgang Zeifang, CTO of Rehm Thermal Systems, who was celebrated for 35 years of service. As the company's first employee shortly after its founding, he has played a key role in shaping and influencing Rehm's success over the decades.

Despite the rain, the summer festival turned into a thoroughly enjoyable day filled with great conversations, delicious food, and cheerful spirits – the perfect way to start the summer holidays.

The weather and atmosphere were just perfect for this year's summer festival, allowing our employees to enjoy a relaxed and cheerful celebration together with their colleagues.

SAVE THE DATE
SHOWS & EVENTS 2026

In 2026, we will once again be present at the key venues of the electronics industry.

Whether it's a trade fair, technology event, seminar, training session, or workshop – take the opportunity to discover our system technology and receive expert advice from the Rehm specialists. For more information about upcoming events, please visit **www.rehm-group.com.**

DATE	EVENT
21. – 22.01.2026	**Pharmapack,** Paris, France
03. – 05.02.2026	**Nortec,** Hamburg, Germany
03. – 05.02.2026	**Southern Manufacturing**, Farnborough, UK
04. – 05.03.2026	**Electronics on the Road**, Köln, Germany
17. – 19.03.2026	**IPC Apex,** Anaheim, USA
25. – 27.03.2026	**Productronica China,** Shanghai, China
25. – 29.03.2026	**26. EE-Kolleg,** Colonia de Sant Jordi, Mallorca
30.03. – 02.04.2026	**Global Industries,** Lyon, France
01. – 03.04.2026	**SSPA Korea,** Korea
15.04.2026	**EPP Forum 2026,** Böblingen, Germany
21. – 23.04.2026	**Nepcon China,** Shanghai, China
21. – 23.04.2026	**InnoElectro,** Budapest, Hungary
22. – 23.04.2026	**Electronics on the Road**, Lindau, Germany
20. – 21.05.2026	**Electronics on the Road**, Heidelberg, Germany
17. – 18.06.2026	**Electronics on the Road,** Salzburg, Austria
17. – 20.06.2026	**Nepcon Thailand,** Bangkok, Thailand

Dates

Here you will find the current dates for trade fairs and events.

We look forward to welcoming you at one of our next events!

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Rehm Worldwide

As a leading manufacturer of innovative thermal system solutions, we have customers on every continent. With our own locations in Europe, the Americas and Asia as well as agencies in 24 countries we are in position to serve the international markets quickly and to offer outstanding on-site service – worldwide and round the clock!

November 2025. Technical changes without prior notice. Art.-No. 1105957