



THERMAL SYSTEMS

#1 review

Customer magazine | Issue 1, 2026

CLEARER PROCESSES. FASTER PRODUCTION.

*How VEGA connects coating,
curing and line control.*

From page 6

NEW DIMENSIONS IN AI

*Precise reflow processes for large
server boards and packages.*

From page 12

AUTOMATION

*How connected equipment, precise processes and digital
knowledge are advancing electronics manufacturing.*

***“AUTOMATION
CONNECTS
PROCESSES – FOR
GREATER EFFICIENCY,
QUALITY AND
SAFETY.”***



Dear readers,

Automation in electronics manufacturing is not an end in itself. It needs to make processes more stable, ease the workload on employees, conserve resources and ensure consistently high quality. That is what guides us at Rehm.

Our customers face very different challenges: high volumes, frequent product changes or particularly demanding assemblies. We therefore do not see automation as a rigid concept. It must suit each production environment and fit into existing workflows.

We support our customers with equipment for soldering, drying and coating, as well as solutions for process monitoring, traceability and line integration. But good solutions are not developed at a desk alone. What matters is talking to the people who work with these processes every day. We listen, run trials together and refine a solution until it proves itself in production.

The production of hardware for AI data centres shows how important it is to combine automation with process expertise. Large server boards, substantial copper areas and ever larger components create new demands for heat transfer during reflow soldering. At the same time, temperature differences must be kept small and process data recorded reliably.

Challenges like these can only be met when the equipment, software, process and application work together. Our aim remains practical: to give our customers the tools they need to manufacture new technologies reliably and economically.

Enjoy the reading!

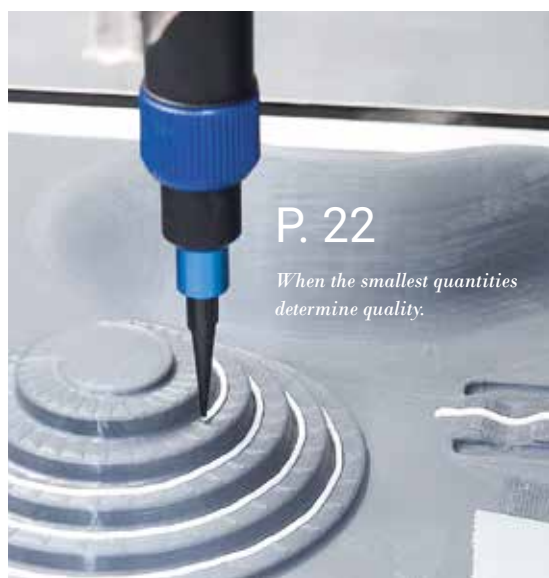


Johannes Rehm
Managing Director



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CLEARER PROCESSES. FASTER PRODUCTION.

Schiltach. VEGA Grieshaber KG has been developing innovative measurement technology in Schiltach since 1959. It employs more than 2,700 people and has subsidiaries in 28 countries. The company is expanding production capacity and introducing new processes to improve efficiency and sustainability.





EGA Grieshaber KG is taking further steps in its growth strategy. The first phase of a major project in Kuppenheim will see several buildings constructed on a site covering around 10.4 hectares. Two production buildings with manufacturing space and an integrated logistics area are planned, providing a total of 32,000 square metres.

Around 300 MIL.

components are placed on four SMT lines each year.

In Mason, USA, VEGA doubled its production space in 2025. Electronics manufacturing now has 2,600 square metres at its disposal. Around 1,300 people work at the headquarters in Schiltach. Of these, some 160 development engineers and 100 IT specialists are advancing level and pressure measurement technology. In electronics manufacturing, four SMT lines place approximately 300 million components a year over two shifts. The portfolio includes level and pressure sensors for chemical and pharmaceutical plants, the food industry, drinking-water supply, metal production, wastewater treatment and power generation.

Product diversity demands considerable innovation and flexibility in production. Alongside technical capability, the current investment projects focus on energy efficiency and productivity.

Since April 2026, the electronics manufacturing team has had a new coating line to help meet these goals. Alongside three Rehm VisionXP+ reflow soldering systems, Rehm Thermal Systems GmbH has integrated a turnkey solution for the coating process. At its heart is ProtectoXP, Rehm's flexible coating system.

This is an important step towards the planned standardisation and further development of production.



VEGA Grieshaber KG employs around 1,300 people at its Schiltach headquarters.

A new coating line for high-quality electronics

The coating line has now been integrated into production and accepted under real operating conditions. Demand for effective protection of high-quality electronics in increasingly automated production continues to grow. The need for a modern, more efficient solution, together with defined productivity targets, prompted electronics manufacturing managers Marcel Schrempp and Michel Wucher to launch a benchmarking and investment project in November 2024.

The project team explored the market and the available technology. Following an initial trial and evaluation phase, VEGA made the fundamental decision in May 2025 to use Rehm ProtectoXP and a turnkey Rehm coating line. A complete line was configured around VEGA's requirements. Alongside new handling modules, inline coating inspection and an RDS UV LED curing system, the plans included a software control system from Resitco GmbH, a Rehm Group subsidiary.

Further trials with different coatings and materials at the Rehm Application Centre in Blaubeuren allowed the team to test the equipment and obtain advice, analysis and guidance on selecting protective coatings and curing methods. The results informed the complete line, comprising ProtectoXP and a modern curing system. The latest generation of RDS UV LED was unveiled at productronica in Munich in 2025 and, after extensive testing, was integrated into VEGA's solution as one of the first installations.

“Our expectations of the technical capabilities and efficiency have been fully met by our investment in Rehm equipment. It also supports our sustainability strategy.”

___Marcel Schrempp

VEGA Grieshaber KG



The new coating line at VEGA Grieshaber KG.

Depending on the order, assemblies from the various SMT lines are fed into the new coating line and coated, including selectively. UV LED coating eliminates time-consuming rework, improves the quality and service life of electronic assemblies and provides better protection against moisture, corrosion, chemicals and dust.

The line also improves productivity and energy efficiency. The investment has made the curing process up to 70 percent faster than with conventional gas UV lamps or convection ovens. The control system plays a central role. Its modular, manufacturer-independent Device Manager sits between the process equipment and VEGA's MES. It guides individual orders through the line, gathers traceability data and reports it to the MES. The software integrates the line modules, combines and condenses their data, and allows the line processes to be simulated, analysed, automated and controlled.

The line and software have already been designed to allow an autonomous mobile robot (AMR) to be added later. Based on initial experience, an automated transport system could offer further gains in efficiency and process quality.



For Marcel Schrempp, the investment is another step towards standardised, automated production. Some manual tasks have already been eliminated. Horizontal connectivity, offline control and better use of data in VEGA's own databases all support this strategy.

Central control with Hermes and MES

VEGA is increasingly using the Hermes Standard in electronics manufacturing and plans to integrate more systems in future. In combination with the IPC-CFX interface, Hermes ensures that important assembly information is transferred reliably and completely between machines and used in production control. Rehm's ViCON Connect tools make it easier to prepare equipment offline and control it across the line.

**Up to
70%**

FASTER CURING

compared to conventional gas UV lamps or convection ovens.

Marcel Schrempp plans further projects in machine connectivity, process automation and production expansion. The aim is to reduce downtime, simplify movement through production and make machine operation easier. More efficient process preparation, reduced staffing requirements and faster responses to alarms and faults will increase productivity.

The integration and acceptance of the new ProtectoXP line have already taken VEGA a step in that direction. "Our expectations of the technical capabilities and efficiency have been fully met by our investment in Rehm equipment," says Schrempp. "It also supports our sustainability strategy."

Reflow soldering systems: saving energy and nitrogen

VEGA currently has four VisionXP+ reflow soldering systems in use worldwide. The convection soldering systems in the Vision range are flexible and efficient, and deliver high throughput even with frequent product changes.

VEGA intends to save more energy in its placement processes by making greater use of Rehm's software capabilities. Improved oven insulation keeps the surrounding temperature largely unaffected and allows the ovens to heat up more quickly after a weekend shutdown. Staggered start-up to avoid power peaks and Rehm's patented mechatronic curtain can deliver further savings. The curtain adjusts to the height of each assembly according to the programme and maintains an optimum gap, significantly reducing heat and nitrogen losses.

2,600 m²

of electronics manufacturing at the Mason Facility



4

VisionXP+

reflow soldering systems worldwide.



The VEGA project team appreciates its partnership with Rehm Thermal Systems.



Expanding the partnership with Rehm Thermal Systems

The relationship, which began in 2009, has deepened over the years. Both companies value the partnership and continue to develop it. The flexibility and customer focus of the Rehm project team during this investment once again demonstrated its practical approach.

The entire Rehm Group project team was pleased with the partnership: "We value the close proximity and friendly relationship, as well as the straightforward communication and

genuine commitment to service." Marcel Schrempp of VEGA Grieshaber KG in Schiltach adds: "The ability to adapt flexibly and work closely together will remain important competitive advantages."



VEGA Grieshaber KG's product range in Schiltach includes level and pressure sensors.

WHEN AI HARDWARE REACHES NEW DIMENSIONS

Rehm optimises reflow processes for large server boards and packages.

AI server boards: greater performance changes the demands on electronics manufacturing

Few areas of electronics have developed as rapidly in the past two or three years as hardware for artificial intelligence. As AI data centres expand, computing power and integration density rise – and so do the demands placed on server boards, packaging, power supply, data transfer and cooling.

Modern AI systems are evolving from conventional servers into highly integrated rack-scale platforms. NVIDIA's GB200 NVL72 is one example: this liquid-cooled system combines 36 Grace CPUs and 72 Blackwell GPUs, using a large NVLink domain for communication between accelerators. It shows how closely computing density, power consumption, connectivity and thermal demands are now linked.

Modular hardware architectures are also gaining ground. Through its Data Center Modular Hardware System (DC-MHS), the Open Compute Project is advancing standardised form factors and interfaces for modular server platforms.

The aim is to improve interoperability between key hardware components and make data-centre platforms easier to adapt to different performance requirements and applications.

Data-transfer speeds on the board are rising sharply too. PCI Express 6.0, for example, reaches 64.0 GT/s and up to 256 GB/s in an x16 configuration – twice the speed of PCIe 5.0. It uses technologies including PAM4 signalling and forward error correction. For server-board designers and manufacturers, this means that circuit boards are becoming more complex not only thermally, but also in signal integrity, layout, materials and production quality.

The next technological leap: more integration, larger packages and optical connections

The pace of development is likely to increase. More powerful GPUs and AI accelerators, closer CPU–GPU integration, high-speed networks, greater memory bandwidth and rising

power density are driving integration at both board and rack level. Liquid cooling is also becoming more important in densely packed AI systems. Today's rack-scale platforms already rely on it to manage high computing densities. For electronics manufacturing, these developments are crucial. Larger packages, substantial multilayer boards, high copper content and varying thermal masses must all be processed reliably within increasingly tight process limits. Optical assemblies and, in future, larger co-packaged optics (CPO) structures bring electronic and optical functions closer together.

The key to process reliability is therefore to deliver heat to the assembly evenly, reproducibly and with precise control, as well as quickly.

This is where Rehm Thermal Systems' version of the VisionXP+, optimised for large AI assemblies, comes in.

Optimised reflow processes for AI server boards

More powerful AI chips, optical high-speed interconnects and ever larger packages raise thermal complexity to a new level. With a specially optimised VisionXP+, Rehm Thermal Systems offers an inline reflow solution that heats large AI motherboards and optical assemblies evenly and reproducibly, with a high degree of process control.

This version of the VisionXP+ convection soldering system is designed for large assemblies used in AI data centres and optical data transmission. Its modified heat-transfer system reduces temperature differences even on substantial multilayer boards and very large BGA packages.

It addresses a central challenge in modern AI hardware: **every solder joint must reach the required process window without placing excessive thermal stress on sensitive or fast-heating areas of the assembly.**

AI infrastructure changes the demands on SMT production

**17
zones**

for greater process flexibility.

The growth of AI data centres is accelerating the development of performance-optimised server architectures. System designs are changing too: conventional servers are giving way to highly integrated rack-scale platforms with CPU, GPU, switch, network and power boards.

**Up to
120**

assemblies per hour.

Depending on the system configuration.

Large accelerator packages, high layer counts, substantial power and ground planes, and densely populated boards combine high thermal mass with widely varying heat absorption across a single assembly.

Large BGAs for AI and optical data processing are particularly critical. Packages measuring 100 × 100 mm or more are not unusual in these applications. Rehm's process trials include an AI motherboard with a 160 × 160 × 5 mm



BGA. Components of this size are sensitive to temperature gradients during reflow: the package and circuit board can warp dynamically, sometimes in different directions.

Even heating helps prevent warpage and open solder joints

If the edges, centre and underside of a large package heat at different rates, the risk of dynamic warpage rises. Combined with oxidation, limited solder-paste height or warpage at a critical point, this can cause head-in-pillow defects, non-wet opens or intermittent connections. Small passive components, connectors and temperature-sensitive parts must not overheat either. Simply increasing the peak temperature will not solve the problem. Controlled, even energy transfer across the whole assembly is what matters.

VisionXP+: extended process length and targeted heat transfer

The standard VisionXP+ configuration has nine preheating zones, four peak zones and four cooling zones. Its 4,550 mm process length provides flexibility for gentle heating ramps, effective thermal equalisation and controlled time above liquidus.

For greater process flexibility and thermal capacity, Rehm also offers configurations with twelve preheating zones, five peak zones and a process length of 6,050 mm.

Individually controlled zones and coordinated nozzle arrays help deliver even heat transfer to complex assemblies. At a conveyor speed of 800 mm/min, Rehm gives a reference throughput of up to around 120 assemblies per hour for a 300 mm product with a 100 mm gap. Actual throughput depends on the product, required process window and system configuration.



Optimised heat transfer for large AI motherboards

The system's heat transfer has been further developed for AI server applications. Tests on an AI motherboard with a $160 \times 160 \times 5$ mm BGA found a temperature difference of less than 5°C within the package and less than 10°C across the board. These results apply to the reference assembly tested. The achievable temperature difference for another product must be qualified using a multi-channel temperature profile of that assembly.

Nitrogen, cooling and data-based process reliability

Optical modules present additional production challenges. Solder joints are increasingly used instead of thermal paste to connect heat sinks and metal housings. Nickel-plated surfaces can oxidise during soldering in air, causing wetting defects. A nitrogen atmosphere with less than 500 ppm residual oxygen significantly improved wetting. According to Rehm, the patented mechatronic nitrogen curtain on the VisionXP+ can reduce nitrogen consumption by up to 20 percent. A newly developed modular cooling section also allows defined cooling gradients. EC fans, a three-stage Eco Mode and a closed cooling circuit support energy-efficient operation. Low-maintenance residue management with pyrolysis helps keep the process environment stable, even with demanding solder pastes and long production runs.



AI server boards present new manufacturing challenges.

From oven recipe to production process

For production approval, Rehm recommends profiling the actual product at all critical measurement points. These include in particular:

- **the centre and corners of large BGAs**
- **substantial copper areas**
- **high-current connections**
- **temperature-sensitive components**

Alongside peak temperature and time above liquidus, particular attention should be paid to temperature differences across the assembly, heating and cooling rates, and dynamic warpage. Versions with a vacuum process and optional formic acid are available where the required voiding performance calls for them.

Full visibility in the reflow process

The VisionXP+ supports the Hermes and IPC-CFX communication standards and integration with MES and ERP systems. The ViCON software ecosystem captures and visualises relevant process data, while ProMetrics profiles and monitors the soldering process. A temperature profile that has been qualified once can thus become a continuously monitored, traceable production process. For valuable, complex AI assemblies, this level of process reliability is essential.

Precise reflow processes for the next generation of AI hardware

The next generation of AI servers places greater demands on electronics manufacturing: larger packages, higher thermal masses, more complex multilayer structures and increasingly demanding optical assemblies must meet ever tighter quality and reliability requirements.

With the optimised VisionXP+, Rehm Thermal Systems focuses on controlled, even and reproducible energy transfer across the assembly. This creates the process window needed to manufacture large AI server boards and optical assemblies reliably.



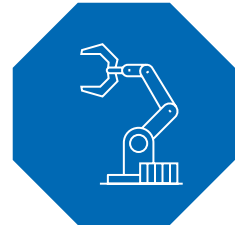
“For large AI packages, what matters is how evenly and reproducibly energy reaches every solder joint. The optimised VisionXP+ takes account of the motherboard’s thermal mass and minimises temperature-related warpage in large BGAs.”

—Ralf Wagenführ

Director of Operations, Rehm Thermal Systems Dongguan



When machines speak the same language



The interfaces modern electronics manufacturing needs – and how Rehm and RESITCO connect equipment, processes and data

In electronics manufacturing, a machine's process performance is no longer the only measure of its value. Its ability to fit into an existing line, process order and product information, and send relevant process data to higher-level systems matters just as much.

This is particularly true of soldering, drying and coating equipment. It generates quality-related data that must be clearly linked to an assembly, an order, a material and a recipe version. From the customer's perspective, the question is therefore not simply, "Does the machine have a network connection?" It is, "Can it be integrated using standards, securely and without unnecessary dependencies?"

Full equipment integration covers four distinct levels:

1. Physical material flow: the assembly is passed to the next station in a controlled manner.
2. Horizontal communication: neighbouring machines exchange board IDs, product and transport information.
3. Vertical communication: process data, machine states and orders are exchanged with MES, quality systems or ERP.
4. Data semantics: the meaning, unit, timestamp and product context of every data point are clearly defined.

Only when these levels work together do individual machines become an integrated production line.



Fig. 1: Horizontal board flow and vertical data exchange in a connected production line.

Which interfaces matter?

IPC-HERMES for material flow

IPC-HERMES-9852 is designed for direct communication between neighbouring machines in an electronics production line. Along with the physical board, they can pass on information such as:

- *a unique board ID*
- *product or programme name*
- *circuit-board dimensions*
- *transport status*
- *conveyor speed*
- *routing and configuration information*

Hermes supports automatic product changes, conveyor-width adjustments and continuous board tracking. The current version 1.6 also defines procedures for connection failures, pauses, restarts and special oven scenarios.

IPC-CFX for production and quality data

IPC-2591 CFX enables standardised exchange of machine, process and production information, including:

- *machine states and operating modes*
- *active recipes*
- *production events*
- *faults and alarms*
- *process and inspection results*
- *maintenance information*
- *traceability data*

IPC-2591 CFX Version 2.0 was published in 2025. Among other changes, it extends equipment coverage and adds messages for inspection, maintenance, material handling and operator authorisation. Hermes and CFX serve different purposes: Hermes coordinates direct board transfer along the line, while CFX exchanges broader information between machines and higher-level systems.

OPC UA for general machine data

OPC UA is particularly useful for manufacturer-independent machine information such as:

- machine identification
- operating state and mode
- setpoints and actual values
- limits and deviations
- alarms
- component and maintenance status

“OPC UA for Machinery” provides standardised building blocks for this. An OPC UA connection alone is not enough: the underlying information model and the meaning of its variables must also be documented.

What data should machines provide?

Every machine should supply a documented minimum data set:

- machine type, serial number and software version
- current operating state
- order, product and board ID
- active recipe and version
- start and end of processing
- process approval or reason for rejection
- alarms and causes of downtime
- maintenance data and operating hours
- energy and media consumption
- timestamps using a synchronised time base

The data needed beyond this minimum will vary by process.

Which interface for which task?

Guidance for purchasing and integrating production equipment

Interface	Primary function	Customer benefit
IPC-HERMES-9852	Horizontal machine communication: board ID, transport and product changeover	Continuous board flow, automatic changeover and fewer barcode stations
IPC-2591 CFX	Production, process and quality data between machines, MES and IT systems	Standardized traceability, states and alarms with less integration effort
OPC UA	Vendor-independent access to states, operating modes, setpoints and actual values	Consistent machine access for monitoring, control systems and technical integration
REST API	Targeted software functions, master data, recipe and order integration	Flexible connection of customer-specific software with a properly documented API
CSV / JSON	File-based export for analysis, archiving or transitional solutions	Low entry barrier, but no substitute for event-based real-time communication

Recommendation: Combine standards by task instead of using one interface for every purpose.

Original illustration: Rehm / RESITCO

Context matters: a temperature reading needs a measurement point, unit, timestamp and product reference. The zone temperature of a soldering system must not be equated with the actual temperature on the assembly. Product-specific profile values should only be reported if they have been measured or determined by a validated system.

RESITCO connects machines, lines and MES

Resitco adds software for SMD manufacturing, line integration and smart-factory applications to the Rehm Group's equipment and process expertise. RESITCO has been part

of the group since 2025. Together, the companies can provide line planning, soldering, drying and coating technology, and digital connectivity.

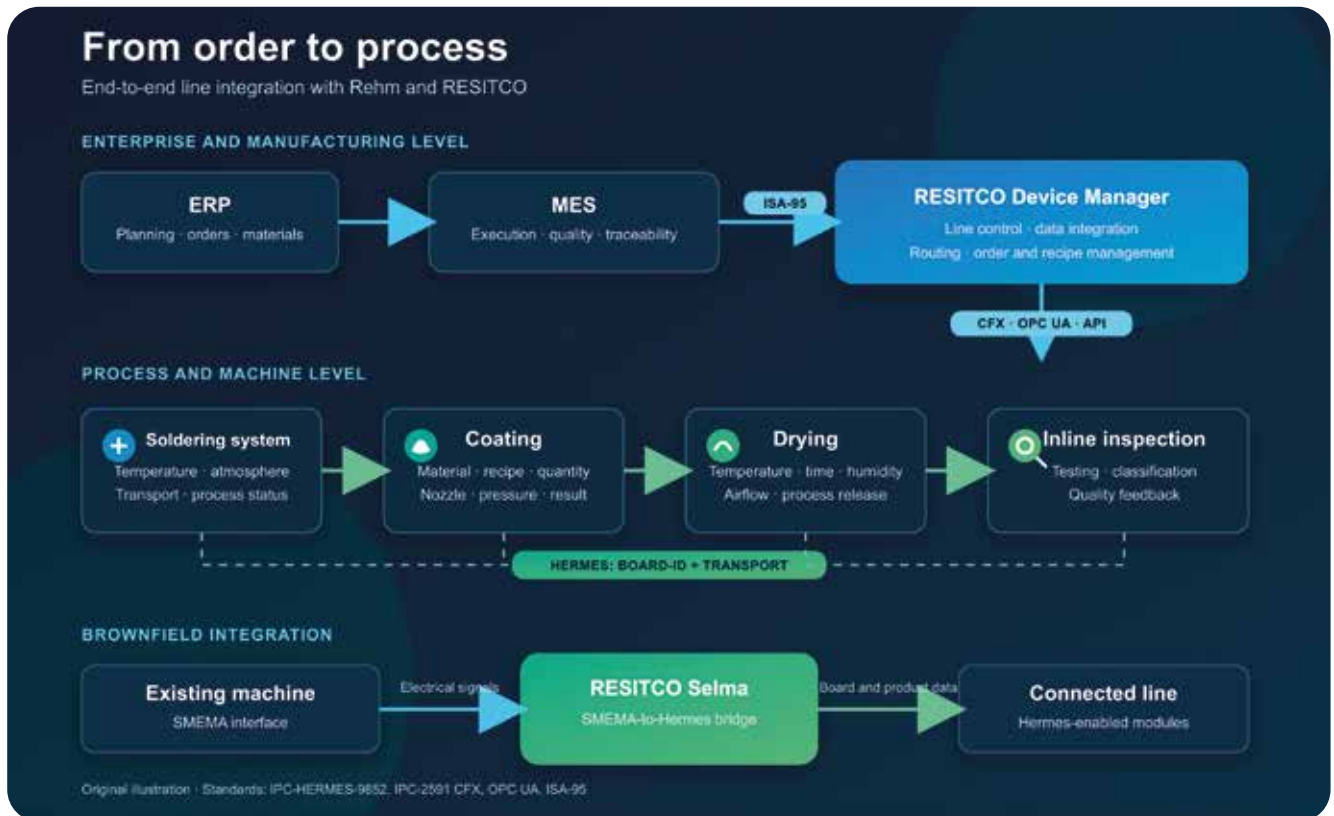


Fig. 2: The Device Manager connects order control, process equipment and traceability.

Device Manager: the link between line and MES

The modular RESITCO Device Manager sits between the process equipment and higher-level production software. Depending on the line design, it can:

- receive production orders from the MES
- guide orders and assemblies through the line
- coordinate machines from different manufacturers
- provide product and recipe information
- record machine and process states
- consolidate traceability data
- report production information to the MES
- apply customer-specific routing and process rules

The MES therefore does not need a separate custom connection to every machine. The Device Manager combines communication in a shared integration layer.

One practical example is a coating line built for VEGA. There, the Device Manager connects the coating system, UV LED curing, handling and inline inspection with the MES. It guides orders through the line, collects traceability data and sends it to the higher-level system.

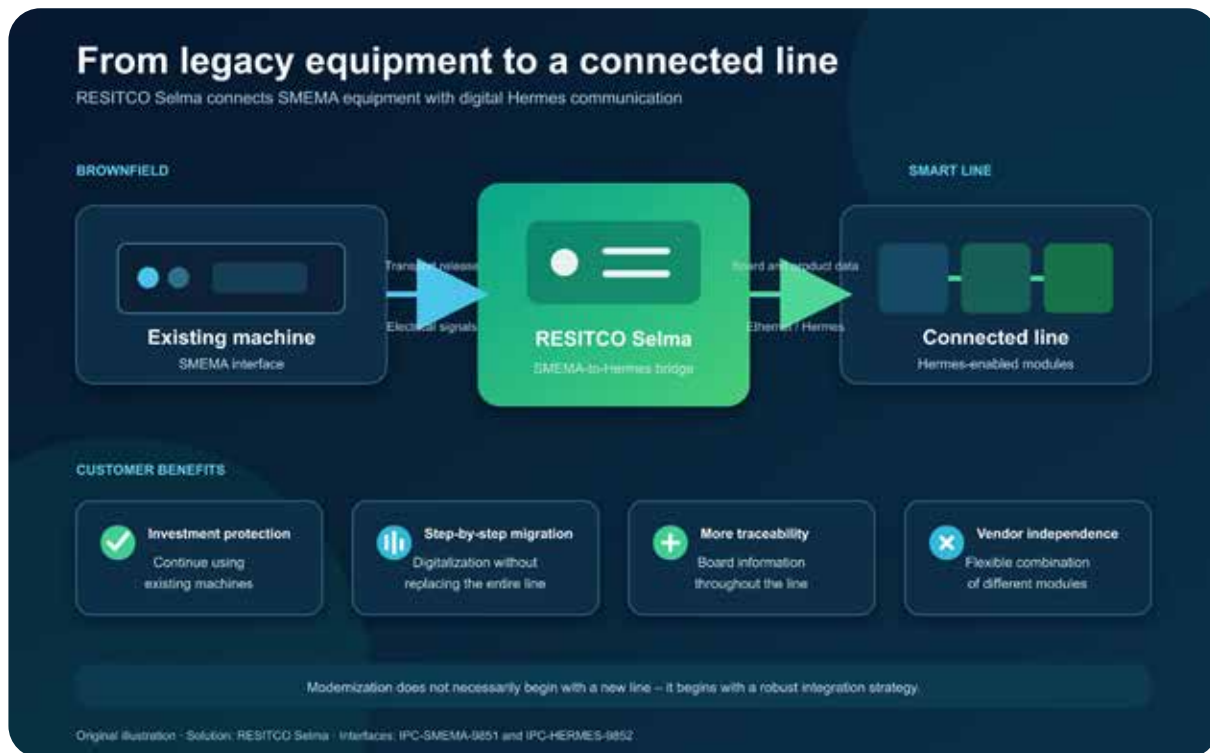


Fig. 3: Selma bridges an existing SMEMA machine and the digital Hermes line.

Keep using existing SMEMA equipment

Many existing machines have only a SMEMA interface. It uses electrical signals to coordinate transport, but does not carry detailed product or traceability information.

RESITCO's "Selma" SMEMA-to-Hermes bridge allows these machines to join a Hermes-based production line. This is particularly useful for companies modernising their equipment in stages.

The benefits for customers:

- existing equipment can stay in service
- new Hermes machines can be added
- investment in existing machines is protected
- digitalisation can proceed in stages
- the whole line does not have to be replaced

What customers should check before buying

The statement "CFX-, Hermes- or OPC UA-capable" is not enough to inform an investment decision. Customers should ask:

1. Which version of the standard is supported?
2. Which messages and data points are available?
3. Are units and variables documented?
4. What read and write permissions are provided?
5. What happens if the connection fails?
6. Is data buffered and sent later?
7. Will the interface remain compatible after updates?
8. Are there additional licence fees?
9. Is a cloud connection required?
10. How long will the software, security and interfaces be maintained?

These points should be recorded in the specification and checked during the factory acceptance test.

Consider cybersecurity from the start

Every additional connection increases the potential attack surface. Connected machines should therefore provide, at a minimum, role-based user permissions, encrypted communication, certificate management, secure updates and controlled remote maintenance.

Equally important are:

- individual accounts instead of default passwords
- logs of sign-ins and parameter changes
- backup and recovery
- documented patch management
- information about software support and product life cycle

IEC 62443-4-1 sets out requirements for secure development and maintenance of industrial automation products, including vulnerability, update and end-of-life management.

Conclusion

A good machine performs its process well. A future-ready machine can also integrate that process securely and transparently into production alongside equipment from other manufacturers.

IPC-HERMES, IPC-CFX and OPC UA provide the technical foundation. With its Device Manager and Selma SMEMA-to-Hermes bridge, RESITCO puts these standards to work in real lines. Together, Rehm Thermal Systems and RESITCO can deliver process equipment, material flow, line control and MES integration as a coordinated system.

For customers, this means less integration work, end-to-end traceability, greater freedom to choose equipment and a staged route from existing production structures to connected electronics manufacturing.



Microdispensing in Medical Technology – Maximum Precision and Repeatability

In modern medical technology, maximum precision in the application of adhesives, coatings, or potting compounds is vital. Especially for medical devices in the highest risk class III, such as implants, the safety and reliability of the end product depend significantly on exact dosing. Microdispensing plays a key role wherever the finest structures must be joined or sealed without impairing the product's function or flexibility.

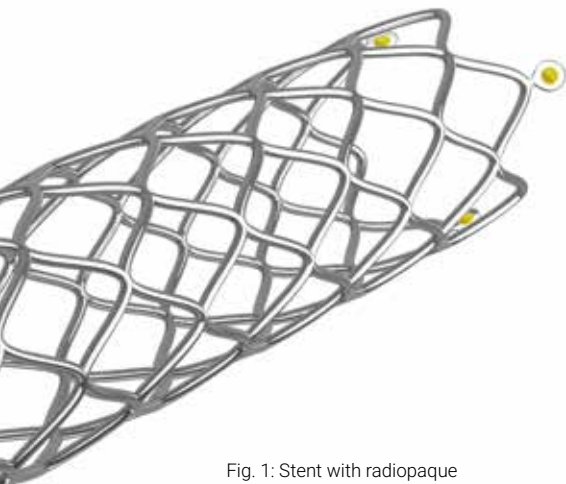


Fig. 1: Stent with radiopaque markers – filled with minimal amounts of adhesive
(Image source: ViscoTec)

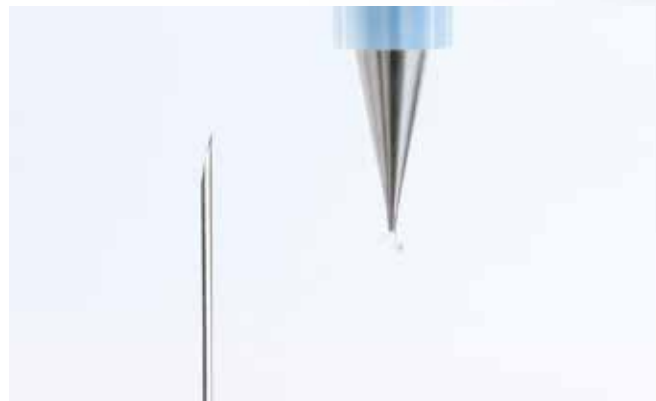


Fig. 2: Size comparison of a micro adhesive dot with a 2.5 mm dispensing syringe tip (Image source: ViscoTec)



Microdispensing as a key factor in medical technology

A clear example of the need for precise dispensing is the deep brain stimulator (DBS). A DBS system delivers targeted electrical impulses to the brain via extremely fine electrodes and thus makes a major contribution to the treatment of conditions such as Parkinson's disease or therapy-resistant epilepsy. Selective adhesive bonds ensure that every single contact point and every block segment is reliably sealed before the next process step. This primary step prevents components from shifting during potting or gaps from opening that would allow the potting compound to penetrate uncontrollably. A secondary barrier is then created by potting that completely encapsulates the components. This produces a homogeneous protective layer over all components to ensure long-term biocompatibility as well as high vibration and shock resistance of the implant. Because body fluids tend to migrate into the gap between the primary and secondary barriers, in some cases it is advisable to apply an adhesion promoter in between to provide even greater protection and a long-term stable seal.

Exact adhesive application is also essential in the production of stents. In particular, stents made from materials with low radiopacity, such as nitinol, are difficult to see in X-ray images.

To enable precise positioning in the body nonetheless, tiny radiopaque markers are applied. For this purpose, gaps of only 15 – 30 µm are filled with minimal quantities of adhesive. These micro-doses preserve the stent's mobility, maintain its flexibility, and at the same time ensure long-term biocompatibility.

Another typical field of application for Microdispensing is catheters – highly flexible, soft systems used in many minimally invasive procedures. Here, a wide variety of components, such as connectors, must be joined within tight tolerances. Adhesives are dispensed as tiny, precisely placed dots so that they hold reliably while neither impairing the catheter's flexibility nor restricting flow in its lumens. Overdosing could lead to constrictions, blockages, or even particle detachment, while underdosing would create mechanical weak points.

Whether pacemakers, stents, or catheters – in all products it is crucial that the adhesive is applied exactly at the intended location and in the correct quantity. Only controlled application with minimal tolerances reliably minimizes risks, ensures full component functionality, and meets the high requirements for safety, quality, and long-term stability.

Technological challenges and solutions

Microdispensing places high demands on dispensing system precision, since even the smallest deviations can significantly affect the result. The axis accuracy of the dispensing platform must be extremely precise and repeatable. Among the greatest challenges, however, are material variations caused, for example, by temperature differences, entrapped air, or manufacturer-related viscosity deviations. Time/pressure dispensing systems reach their limits here because their dosing result depends heavily on the fill level of the pressurized cartridge: a full, half-full, or nearly empty cartridge leads to different application volumes, since air compresses very differently than liquid. In medical technology, exactly reproducible dispensing is essential, because inaccurate quantities not only lead to scrap and rework, but in the worst case can pose a direct risk to the patient.

In addition to its own applicators, Rehm Thermal Systems has been relying for some time on ViscoTec's precise dispensing technology. A key advantage is the eccentric screw technology installed in the dispensers, which is integrated, among other things, into Protecto systems. With volumetric conveying via a rotating screw in an elastic stator, the material is transported uniformly and without pulsation. This achieves very high repeatability and makes the process largely independent of viscosity fluctuations. In contrast to time/pressure-based systems, conveying is purely volumetric – the screw displaces exactly the same volume per revolution, regardless of the cartridge fill level. Another decisive advantage: material variations such as temperature changes or fillers have little effect, because the screw can convey even highly viscous or filled media gently and at a constant delivery rate. Even with sensitive media, the material structure is not damaged, and there is no air entrapment or phase separation.

To avoid air entrapment between the substrate and the dispensed material, other factors also play an important role. Not only correct programming of material application – such as targeted filling of capillaries – but also subsequent drying and curing is a decisive factor. With an exactly coordinated oven profile, the materials cure completely and form a smooth, homogeneous end result. Depending on the

chemical composition of the materials used, Rehm RDS drying systems are configured individually. Different physical principles of heat transfer, such as IR or UV radiation, are used to make the drying processes as efficient as possible.

Quality assurance through maintenance and calibration

In validated medical-technology production processes, regular maintenance and calibration are crucial to ensure permanently accurate and reproducible dispensing results. A clean applicator is a particular focus – an indispensable basis for flawless application. ViscoTec's precise dispensers also excel here: the eccentric screw valve can rotate both forwards and backwards and offers a programmable retraction for a defined string break without dripping. This prevents unwanted material discharge after the dispensing step.



Fig. 3: The preflow eco-PEN XS was specially developed for dispensing the smallest quantities.
(Image source: ViscoTec)

PRECISE DOSING

Same volume with every turn. Regardless of the cartridge's fill level

IR OR UV

Customised drying and curing processes for various materials.

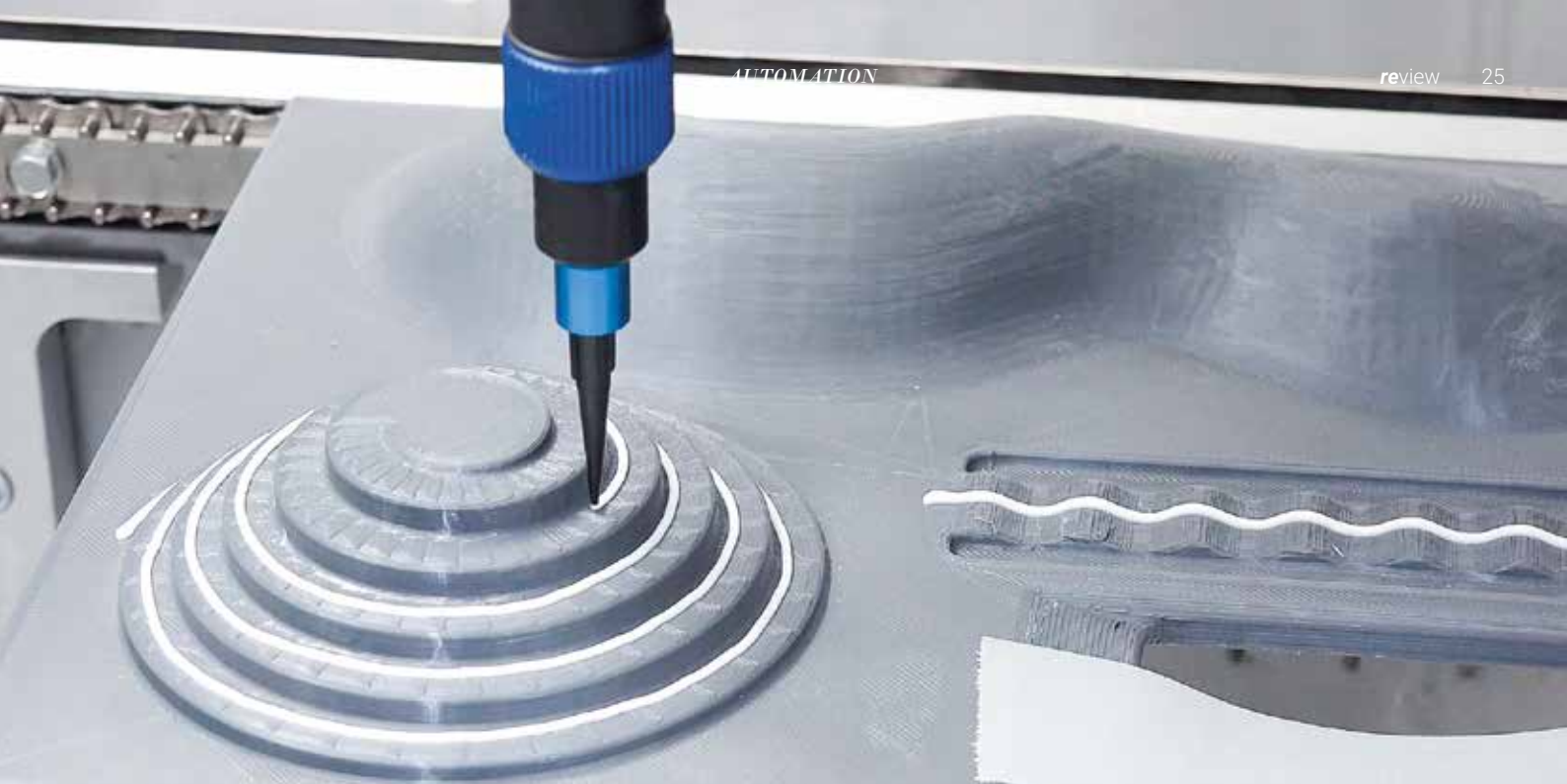


Fig. 4: Precise material application on complex geometries with an integrated 3D height sensor (Image source: Rehman)

In addition, a cleaning tape (WiperXV) is available for Rehman Protecto systems that automatically cleans the dispense needles before each application process and thus ensures consistently high dispensing quality. The dispensing program is loaded under software control and contains all relevant parameters such as material type, nozzle diameter, dispensing volume, and flow behavior. Consistent material output is additionally monitored via high-precision load cells so that deviations can be detected and prevented at an early stage. To reliably determine location and position even for soft or complex-shaped medical products, the systems feature automatic needle measurement, which checks the applicators at defined intervals and automatically readjusts them if necessary. An integrated fiducial camera detects fiducial marks, corrects the zero point, and ensures precise operation even if the assembly is not positioned accurately in the workpiece carrier. In addition, a 3D height sensor automatically compensates for any warpage or instability – for example, in very thin substrates.

Flexibility and process reliability in regulated environments

In medical technology, flexibility plays a central role – depending on the application. In prototype construction or with frequently changing product variants, a typical low-volume-high-mix scenario applies: small batch sizes, different

geometries, and constantly new requirements for materials and processes. Here, it is essential that dispensing systems can be adjusted to new applications without conversion and “on the fly.”

Flexibility does not only mean quick program changes, but also the ability to process a wide range of materials in parallel – from highly viscous silicones and low-viscosity acrylates to filled epoxy resins. Modern systems must therefore be able to automatically load and reliably implement different nozzle types, needle lengths, application patterns, and process parameters. Integration into higher-level software solutions also plays a central role: material parameters and dispensing paths are managed centrally and automatically loaded depending on the product, minimizing changeover times and increasing system availability.

At the same time, one must bear in mind that in regulated high-volume production – such as for active implants like pacemakers – flexibility is inherently limited. Here, each production line is validated for a specific product; changes to the process, geometry, or material are only permissible with extensive revalidation. In these cases, process stability takes priority over flexibility, and dispensing systems are usually tailored precisely to one product.

Overall, flexibility remains a decisive factor – especially wherever innovative products, customer-specific variants, or agile development cycles are required. It is not only economically beneficial, but also a prerequisite for producing modern medical technology efficiently and safely.



Fig. 5: Customized line solution – including coating/dispensing, UV LED curing, handling, and traceability (Image source: Rehm)

Automation, regulation, and traceability

Regulatory requirements such as the Medical Device Regulation (EU MDR) are increasingly confronting medical-technology manufacturers with complex tasks. In addition to process reliability, compliance with safety and hygiene requirements plays a central role. As a result, automation is becoming ever more important. This can be seen in developments in the pharmaceutical sector, where EU Annex 1 already stipulated for 2023 that operator intervention must be minimized as far as possible. It can be assumed that this trend will increasingly be reflected in medical technology as well. In addition, systems often need to be suitable for cleanroom use – for example, Rehm Protecto systems for medical technology are designed for an ISO 7 environment.

Material compatibility is also particularly important in all areas that come into contact with the dispensing medium. This applies above all to metallic surfaces through which the materials are conveyed. To ensure biocompatibility, aluminum surfaces are often replaced by stainless-steel variants. UV-curing acrylates, biocompatible epoxy resins, silicones, and other specially approved medical dispensing materials are frequently used. When selecting the right adhesive or potting compound, a key factor is whether it is a long-term implant that remains in the body for years or a temporary system. For long-term implants, the material used must be permanently biocompatible – especially if the bond is in

direct contact with tissue or bodily fluids. If the adhesive, on the other hand, is located inside a biocompatible potting compound or is completely enclosed in a welded titanium housing, the material itself does not necessarily have to be biocompatible. In such cases, aspects such as adhesion properties and curing time tend to be the main focus.

Data monitoring and analysis are an integral part of automation in modern medical-technology production and are understood not only as a quality-assurance measure, but also as a regulatory necessity. In a validated environment, production processes must be traceable for many years. If a problem occurs – for example, if individual products are faulty at the customer – it is not sufficient to roughly narrow down a production period. Systems must be able to evaluate exactly which serial numbers are affected, which process parameters were present during dispensing, and under which conditions the product was manufactured. This enables targeted recall actions without unnecessarily removing intact products from the market. This is made possible by consistent traceability with individually configurable interfaces and continuous data acquisition. Temperatures, material batches, serial numbers, and process histories can be captured and synchronized horizontally between machines and reported vertically to higher-level MES systems. In addition, material and process interlocks provide extra safety: before each start, the system checks whether the currently loaded program actually matches the intended product and material. If anything does not match, the process is not released and



is automatically locked. These measures achieve seamless traceability and enable immediate response to process deviations – making a decisive contribution to patient safety in medical technology.

From development to series production – “Design to Automation”

A particular challenge lies in scaling prototypes up to series production. New products go through lengthy development and validation phases, and only once all processes are qualified may they be transferred to series production. To shorten these timeframes, it is crucial to consider future automation already during product development – an approach known as “Design to Automation.”

At its in-house Technology Center, Rehm – together with ViscoTec – supports customers and interested parties as early as the development phase by carrying out practical trials using original products. Under realistic conditions, optimum process parameters for later series processes can be identified and potential challenges addressed at an early stage. This close collaboration upfront makes it possible to significantly accelerate the transition from development to production and to avoid later adjustments or revalidation.



Fig. 6: FDA-compliant 1K Applicator vipro-HEAD during bonding of a pacemaker (Image source: ViscoTec)

Precise, gentle, and reliable: Microdispensing with ViscoTec and preeflow

Volumetric dispensers such as the systems from ViscoTec and preeflow enable continuous, material-sensitive dispensing of one- or two-component fluids and pastes – regardless of viscosity. Especially in medical technology, where smooth and sterile surfaces are essential, the retractable mechanism ensures a clean string break without dripping. With dispensing accuracy of up to $\pm 1\%$, adhesive quantities in the microliter range can be applied precisely and reproducibly, allowing even the smallest components such as catheters, balloons, or connectors to be bonded reliably. The process provides a high level of process reliability. Depending on requirements, the systems are used as stand-alone devices, in automated systems, or integrated into control and switch cabinets. In particular, compact preeflow dispensers are suitable both for manual dispensing tasks in the lab or production and for automated manufacturing of medical-technology components. Their robustness has already proven itself in the automotive and electronics industries and has been specifically adapted to medical standards.

The new vipro-HEAD medical grade pressure heads were developed specifically for applications where safety, material compatibility, and patient-specific care are the focus. All product-contact parts are made of stainless steel or plastic-/elastomer-based materials with FDA certification; an autoclavable variant up to 121 °C is also available.

With the preeflow eco-PEN XS 180, a particularly powerful micro-dispenser is available. It was designed for ultra-small dispensing volumes and is considered the most precise volumetric system in its class today. Its compact design makes integration into tight pitch dimensions easier and enables parallel operation of multiple units. Eccentric screw technology ensures extremely gentle, low-shear conveying – an important advantage for sensitive or highly filled adhesives as used in high-end medical devices.

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Conclusion

Microdispensing is now a decisive building block in the production of modern medical devices. It combines precision, material expertise, and process reliability in the smallest possible space. With innovative technologies such as eccentric screw dispensing, intelligent calibration and monitoring systems, and consistent traceability, companies such as Rehm Thermal Systems and ViscoTec create the basis for reliable, safe, and cost-effective manufacturing processes in medical technology.



***CREATE YOUR
CONNECTIONS.***

***PEOPLE, PLACES
AND MOMENTS
THAT CONNECT.***



Six cities, many conversations – and an industry on the move

Mexico's electronics industry is growing across many strong manufacturing regions. To stay close to users, you need to go where products are made, developed and discussed. In 2026, that took Rehm Thermal Systems Mexico to six cities and six SMTA Expo & Tech Forums.

Talking face to face

Monterrey, Ciudad Juárez, Querétaro, Chihuahua, Reynosa and finally Guadalajara: over several months, the SMTA Expo & Tech Forums brought Mexico's electronics manufacturers together. Rehm Thermal Systems Mexico supported the series as main sponsor and used the regional events to do what digital channels cannot replace: talk in person with users, partners and industry colleagues.

The SMTA format is particularly well suited to a market like Mexico. Instead of gathering the industry in one central location, the events travel to key manufacturing regions. Technical presentations, the exhibition and networking sit close together. Process and production engineers meet manufacturers, suppliers and technology partners – and broad industry topics quickly become practical discussions about everyday production.

Closer to customers means more than shorter distances

For Rehm Mexico, this presence is part of a development that goes well beyond trade fairs. Mexico's electronics industry spans several industrial centres. As production capacity grows, so does the need for locally available process expertise, training and technical support.

That is where the Rehm Technology Center in Guadalajara comes in. Since its new premises opened in 2025, customers have been able to examine applications, run trials, optimise processes and train employees there. The focus is the specific production task, from the assembly and material to the right process window, rather than any one machine.

The SMTA tour and Technology Center complement each other. Regional events generate contacts, questions and new ideas; in Guadalajara, these can become practical trials and joint projects.



Rehm Mexico talking to trade visitors.

**MORE
THAN
100**

*exhibitors at the final
SMTA event in
Guadalajara.*

The final stop: Guadalajara

The Mexican SMTA series concludes with the Expo & Tech Forum in Guadalajara on 7 and 8 October. With more than 100 exhibiting companies and an extensive technical programme, it is an important meeting place for Mexico's electronics industry.

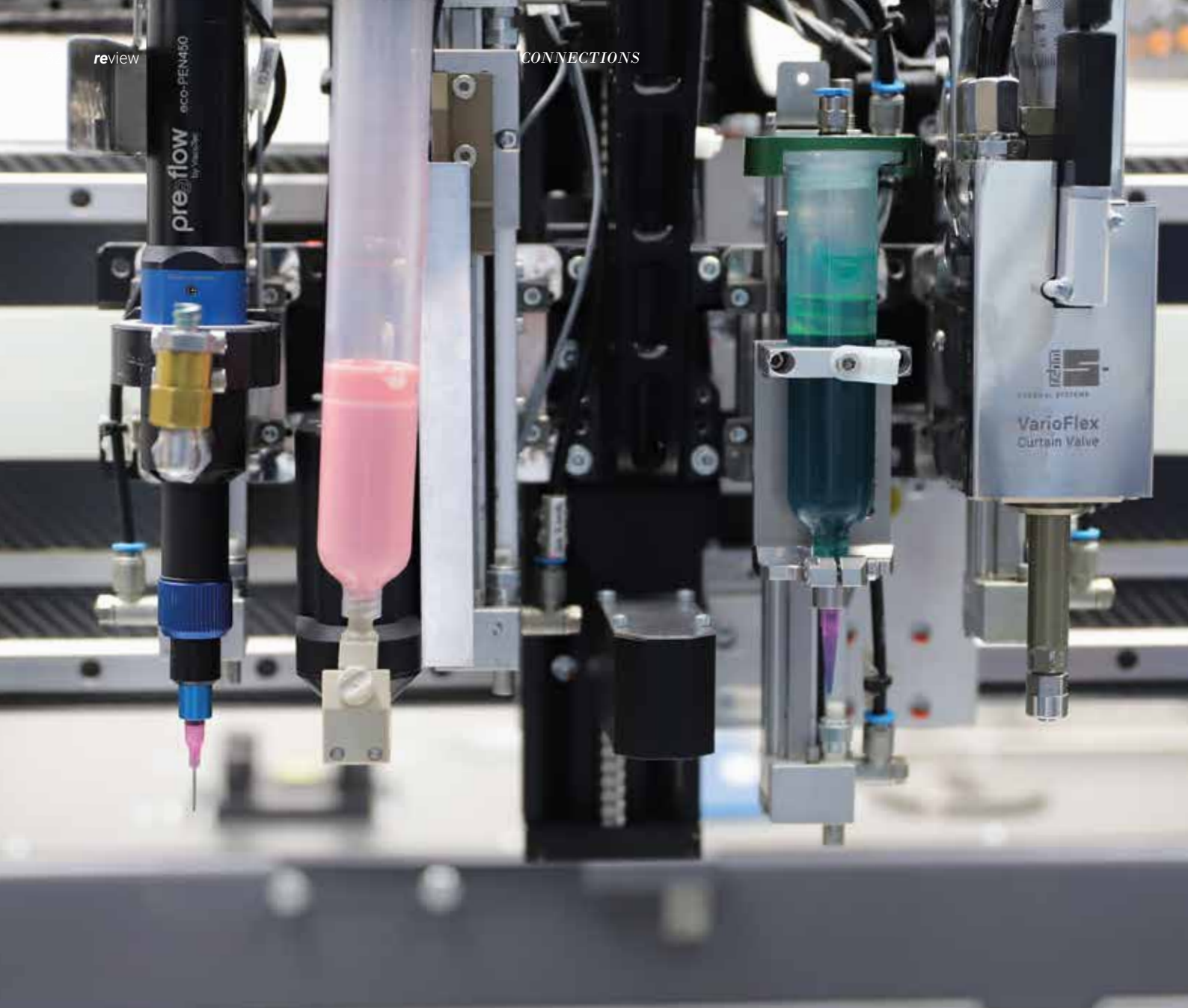
The event is also significant for Rehm because the Mexico Technology Awards are presented there. Rehm Mexico has previously been recognised for its patented mechatronic curtain in 2024 and the Condensox-Line with formic acid in 2025.

The RDS UV LED is in the running in 2026. It combines UV LED technology with stationary, full-area exposure. Short exposure times, reproducible curing and lower energy demand are the focus. Four independently controlled LED segments allow only the area needed to be activated. Compared with conventional UV systems, energy consumption and footprint can each be reduced by up to 70 percent.

Whether it receives another award will be decided in Guadalajara. Either way, the event is a fitting end to the SMTA season: showing technology, sharing knowledge and talking to one another. Closeness grows when people meet, exchange experience and develop new solutions together.

**SINCE
2025**

*the Technology Center
in Guadalajara has
offered space for trials,
process optimisation
and training.*



***SOMETIMES
THE BEST SOLUTION
STARTS WITH A
GOOD QUESTION***

Which material suits our process? How can we make an application more stable? Where can we save time or energy? In manufacturing, practical questions like these often lead to new solutions. Bondexpo is a place to discuss them together.

From 6 to 8 October 2026, specialists in bonding, potting, sealing and foaming will meet in Stuttgart. For Rehm Thermal Systems, Bondexpo is above all an opportunity to talk with users. Hardly any two dispensing or curing processes are alike: materials differ, assemblies present different demands, and cycle times, shapes and quality requirements make every application unique.

What looks straightforward on paper can quickly become a question of detail in practice. That is why personal discussion is so valuable.

Technology starts the conversation

Visitors can discuss their own applications and challenges with specialists at the Rehm stand. ProtectoXC and RDS UV LED are there as starting points for a discussion about the whole process, from precise material application to efficient curing.

Which solution suits the task? How can processes become more repeatable? Where could energy demand or process times be reduced? And how can different process steps work together?

These questions are best answered where theory and practice meet. Bondexpo creates the setting: visitors can see technology, share experience, compare approaches and perhaps discover a solution no one had considered before. Sometimes the most valuable thing you take home from a trade fair is an idea that changes your next process.



Discover Protecto at the stand and discuss your application with our experts.

REHM THERMAL SYSTEMS AT BONDEXPO

6 – 8 October 2026
Hall 6, Stand 6505
Messe Stuttgart



Where conversations spark new ideas

Trade fairs bring people together to share new perspectives and find answers. That is the idea behind the new EFX – and Rehm Thermal Systems has been involved from the start.

When EFX opens in Stuttgart for the first time from 6 to 8 October 2026, it will bring together an industry in transition. Digitalisation, automation, sustainability and smart manufacturing are changing electronics production and the demands it places on processes, technologies and people.

How can these developments be put to good use in daily production? Where does automation make sense? How can processes become more efficient and resource-conscious? And what do employees need to keep pace with technological change?

Rehm wants to discuss these questions at EFX. As a launch partner and member of the exhibitor advisory board, it has supported the new event from the outset. The aim is to create a place

where people share knowledge and develop solutions together, as well as see new technologies.

Personal exchange beyond the machines

At the Rehm stand, visitors will meet people with experience in different fields alongside solutions for electronics manufacturing. Talks on reflow soldering, coating, digitalisation, training and line automation provide ideas to discuss and invite visitors to bring their own questions.

The EFX Bar Talks and EFX Café will make these conversations even more lively. Coating quality, soldering practice, automation and connectivity will be among the topics. A conversation does

not always have to produce a finished solution immediately. Sometimes a fresh idea, experience from another factory or a new contact provides the crucial impetus. That is the strength of EFX: it brings together people facing similar challenges and gives them room to think about the future of electronics manufacturing together.

REHM THERMAL SYSTEMS AT EFX

6 – 8 October 2026
Hall 9, Stand 9C19
Messe Stuttgart





RETHINKING SERVICE: DIGITAL, INTELLIGENT, PERSONAL

When production equipment needs support, every minute counts. Expectations of service are rising too: solutions should be available faster, information should be transparent and support should be reliable wherever and whenever it is needed. Rehm is developing its service accordingly, with connected digital processes, a central knowledge base and artificial intelligence to support its specialists. Personal contact remains at the heart of the solution.

Service is changing – personal contact remains

Rehm supports customers throughout the life of their equipment with a 24-hour service hotline, an international service network, spare parts, maintenance, upgrades and process advice. Digitalisation provides a new foundation for this commitment. A central ticketing system links service requests with machine information, documents, responsibilities and the history of each case.

This changes not only the tools, but also the way service knowledge is used. Individual emails, notes and personal experience become a shared information base. The responsible specialist can see more quickly which machine is affected, what has already happened and which step makes sense next. Knowledge becomes accessible, transferable and available internationally, while technical responsibility stays with the service team.

The machine becomes a digital knowledge base

In traditional service, the search often begins with the current request. In digital service, it begins with the machine. Master data, configuration, documentation and service history form a digital record of its life. New reports, photos, fault descriptions, work orders and service reports are linked directly to that machine. Each case adds to a dependable technical history.

For customers, this means fewer repeated questions and faster orientation. Serial numbers, known characteristics and previous work need not be gathered again on every call. The hotline, technical support, field service and spare-parts team work on the same case, with clear responsibilities, documented handovers and a shared view of the machine.

From request to solution: five connected steps

- 1. Record the request:** Customers use their familiar contact channel. The issue is logged in a structured way and given a case number.
- 2. Identify the machine:** The case is linked to the relevant machine, putting master data, documentation and service history in context.
- 3. Use knowledge:** The service team assesses the fault, history and documents. Digital search and AI make information easier to access; technical judgement remains with the specialist.
- 4. Coordinate action:** Remote support, spare parts or an on-site visit are planned and documented in one place.
- 5. Preserve experience:** The cause, action and result remain documented against the machine. The confirmed solution adds to the knowledge available for future cases.



All equipment data at a glance. Concept illustration generated using AI.

AI turns service experience into useful knowledge

Every completed service case provides valuable insights. Recording faults, causes, actions and outcomes consistently creates a growing body of knowledge. Machine and case data captured by service flow into ViCON AiDe, Rehm's digital software platform. AI helps specialists



THE CHANGE

From reactive support to an intelligent service process – digitally connected, assisted by AI and focused on quick solutions and high equipment availability.

find information faster, identify connections and narrow down potential causes. For customers, this could mean shorter response times, better-informed recommendations and higher equipment availability.

AI does not replace experience or technical responsibility. It speeds up the search: it can review large volumes of information, summarise service cases and make similar patterns easier to find. People remain responsible for approvals, priorities and technical decisions. Rehm combines the reach of digital tools with the experience of its service specialists.

“Our digital ticketing system brings together service requests and relevant machine and customer data, providing the foundation for ViCON AiDe. The AI-supported platform turns service data into useful knowledge, speeds up fault analysis and helps us reduce downtime over the long term,” says Steffen Griesinger, Team Leader Field Service Management at Rehm.

YOUR BENEFITS

Faster answers. Fewer follow-up questions. Transparent handling. More useful service knowledge – and a service that learns from every case.

Secure and responsible

Machine and service data need clear rules. Roles, access rights, logs and agreed permissions are therefore part of the digital service process. Customers should be able to see which information

is used for which purpose. Remote access or the transfer of condition data only takes place when it is technically provided for, securely implemented and agreed with the customer.

Service with an eye on the future

Digitalisation lays the groundwork for the next stage: rather than only responding to faults, service should in future be able to detect unusual behaviour earlier and highlight where action may be needed – provided suitable data is available and the customer has approved its use. Recurring patterns could, for example, inform maintenance, spare-parts planning, product improvements or preparations for a service visit. Service can thus develop gradually from reactive support towards data-based, AI-assisted and increasingly proactive support.

Customers will notice this change through a better service experience, rather than through a growing list of features: quicker answers, transparent handling, knowledge available internationally and capable contacts who share the same information. Rehm combines human problem-solving skills with digital processes and AI to meet rising expectations of response times, transparency, service quality and equipment availability.

Better together!

In the water, on a bike, on the football pitch or making their way through mud and obstacles, Rehm employees have shown once again that team spirit extends far beyond the working day.

At the Risstal Triathlon in Laupheim, they swam, cycled, ran and cheered one another on. At the JO-CUP company football tournament, teamwork and fun mattered as much as the match itself. The X-Treme Battle in Heroldstatt took things further: around 16 kilometres of trails, hills and obstacles offered plenty of opportunities to suffer together – sorry, have fun together.

Individual performance matters, of course. But supporting one another, laughing together, reaching the finish as a team and getting to know colleagues in a different setting matter just as much. The stopwatch was not the measure of success; the team was.

After the sporting challenges came time to relax. Over food, drinks and the occasional joke about tired legs, everyone could share the day's experiences.



Informed and celebrating together

Before this year's summer party, colleagues attended a company briefing. Current developments, key projects and a look at the months ahead were on the agenda, with time for questions and open discussion.

A special part of the briefing was recognising long-serving employees. Colleagues celebrating 10, 15, 20, 25 or even 30 years with the company were honoured. Their knowledge, commitment and loyalty have shaped our development over many years. We thank them warmly and congratulate them all.

The summer party followed. Colleagues had time to talk and enjoy a relaxed afternoon together.

The day was a reminder of the value of personal exchange, teamwork and appreciation. Thank you to everyone who helped make it happen.

SAVE THE DATE SHOWS & EVENTS

Whether at a trade fair, technology event, seminar, training course or workshop, take the opportunity to see our equipment and speak with Rehm experts. For more information about these events, visit www.rehm-group.com.

Date	Event
22 October 2026	evertiq Expo, Kraków, Poland
27 – 29 October 2026	Nepcon Asia, Shenzhen, China
11 November 2026	Temperature profiling seminar, Blaubeuren, Germany
18 – 19 November 2026	Dark Factory Siemens, Erlangen, Germany
18 – 19 November 2026	Electronics on the Road, Berlin, Germany
9 December 2026	Fault management seminar, Blaubeuren, Germany

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



Current shows
and events.



READY FOR YOUR PRODUCTION. CONNECTIONS FOR THE FUTURE.

Rehm Thermal Systems specialises in connection technologies for electronics manufacturing. Our innovative systems for soldering, drying and coating help customers create reliable connections on electronic assemblies – tailored to their needs, with dependable processes and an eye on the future.

Since 1990, we have developed and manufactured energy-efficient production equipment to the highest quality standards at our headquarters in Germany and a second production site in China. Our subsidiaries and distributors worldwide provide tailored solutions and expert service wherever electronics are made.

Create your Connections – work with Rehm to shape products for the future.



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