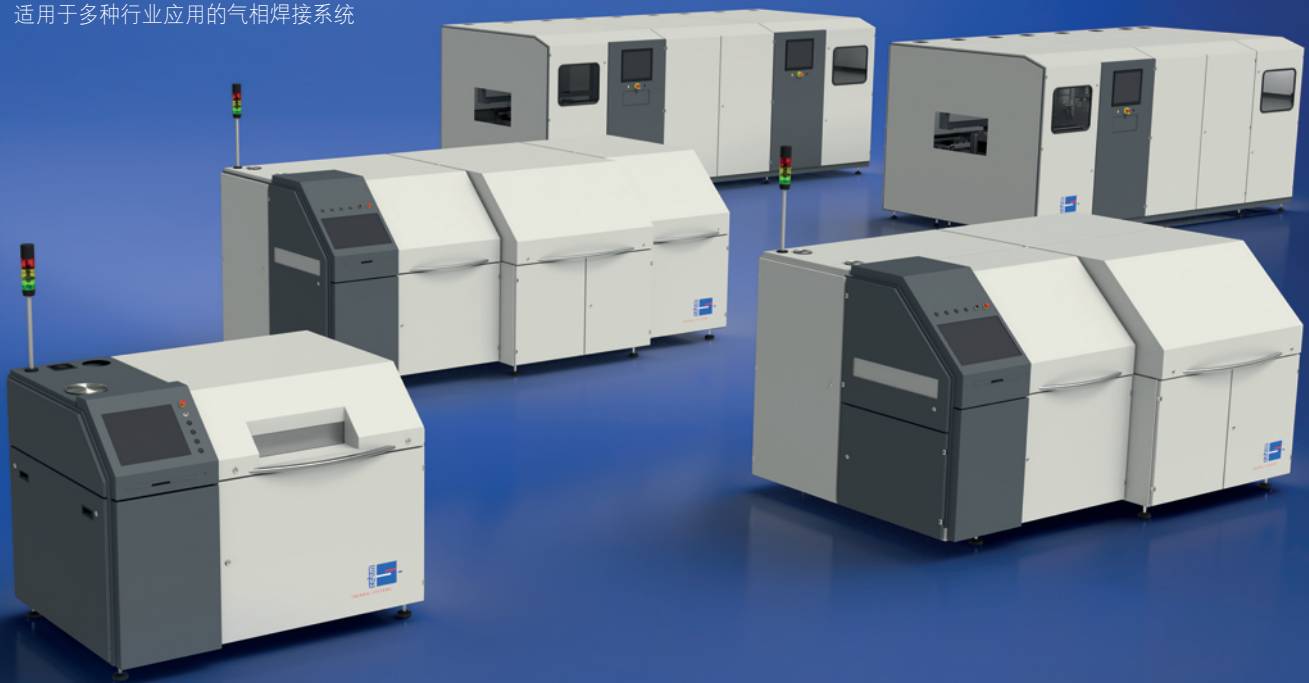


# Top performance with or without vacuum

Reflow condensation soldering for multi-faceted areas of application

## 真空/非真空气相焊接

适用于多种行业应用的气相焊接系统



Condenso series  
Condensation Soldering

# Condensation Soldering

Reliable and flexible!

## Reflow soldering by condensation Multi-faceted processes with the Condenso Condenso气相回流焊接系统 适用于多种行业应用

**The reflow soldering field of industry is wide-ranging, whether it's in aerospace engineering, LED manufacture or power electronics. Electronic components only work in end devices by soldering electronic contacts in a high-quality fashion. But what happens when components on the circuit board are very large or high-mass? Or if vacuum soldering processes should be implemented inline?**

In condensation reflow soldering, or vapour-phase soldering, soldering is accomplished using a hot vapour. To put it in simpler terms: Imagine you have just come from the ski slope and walk into a warm chalet with cold ski goggles. The goggles fog up instantly. This is called film condensation. You can only see clearly again once the ski goggles have reached room temperature. Condensation soldering works based on the same principle.

In this case, heat transfer in condensation soldering is up to ten times higher than with convection soldering. This means that even large, high-mass boards can be reliably processed in a stable atmosphere and with innovative vacuum technology with Rehm's Condenso series.

**无论是在航空航天工程、LED制造还是电力电子行业中，回流焊接得到了广泛的应用。但是，只有高水平焊接才能保证电子元器件的正常工作。对于搭载了大型或重型元器件的PCB板，该如何选择一种新的焊接方法代替回流焊接？当需要联机进行真空焊接制程时又该如何处理？**

实际上凝热或气相焊接都是采用热蒸汽来完成焊接制程。简单来说：假设您刚从滑雪坡上下来，戴着冰冷的滑雪镜走进温暖的小木屋。此时镜片就会立刻起雾，这叫做薄膜冷凝。只有当滑雪镜达到室温时，雾气才会消除。凝热焊接则是基于同样的原理。

与回流焊接相比，气相焊接的热传导效应要高出其十倍以上。锐德Condenso系列亦搭载了创新型的真空技术，尤其适用于稳定制程环境下的大型或重型电路板加工。

# The Condenso series at a glance

## Flexible and adjustable

### Condensos系列：灵活可调 完美匹配

Do you process large and heavy boards for which condensation soldering is out of the question? Or do you want a system that you can reliably carry out vacuum processes with at any time? Then choose a Condenso-Series system that can be customised to your manufacturing environment!

回流焊无法胜任您所制造的大型或重型PCB焊接需求吗？你是否需要一套可以随时提供真空制程的高效系统呢？

请选择锐德Condenso系列气相焊接系统，该系统可根据您的生产环境进行个性化定制，完美匹配您的所有应用需求。



#### CondensoxC

Space-saving and powerful

节省空间，功能强大

- › Batch system for low throughput  
低吞吐量批处理系统
- › Used in laboratory applications, small production lines or prototyping  
适合实验室应用、小型生产线或原型开发



#### CondensoxS smart

Great performance with a small footprint

性能出色，占用空间小

- › Inline ready system for medium throughput  
中型吞吐量准内联式系统
- › Low space requirements  
对空间要求不高
- › Ideal for small-series production  
适用于小批量生产



#### CondensoxM smart

All-rounder for electronics production

全面型电子生产系统

- › Inline system for medium throughput  
中型吞吐量内联式系统
- › Autom. side Loading/unloading with pre-assembled carriers  
采用预装载具侧面自动装/卸载组件
- › Used for small and medium-sized series  
适用于中小型批量化生产



#### Condensosmartline

Ideal for large series

面向大批量应用的在线式系统

- › Inline connection for medium throughput  
中型吞吐量内联式系统
- › Automatic loading, internal carrier return transport  
自动装载，内部载具循环传输
- › Used in series production  
适用于连续性批量化生产

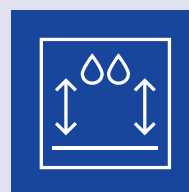


#### Condensox-Line

Reliable in the through-feed process

可靠的联线制程

- › Inline system for high throughput  
高吞吐量内联式系统
- › 3-chamber system and built-in vacuum soldering  
三腔式炉膛及内置式真空焊接
- › Series manufacture and power electronics  
适用于连续性批量化生产及电力电子制造





# Vapour phase soldering in every manufacturing environment

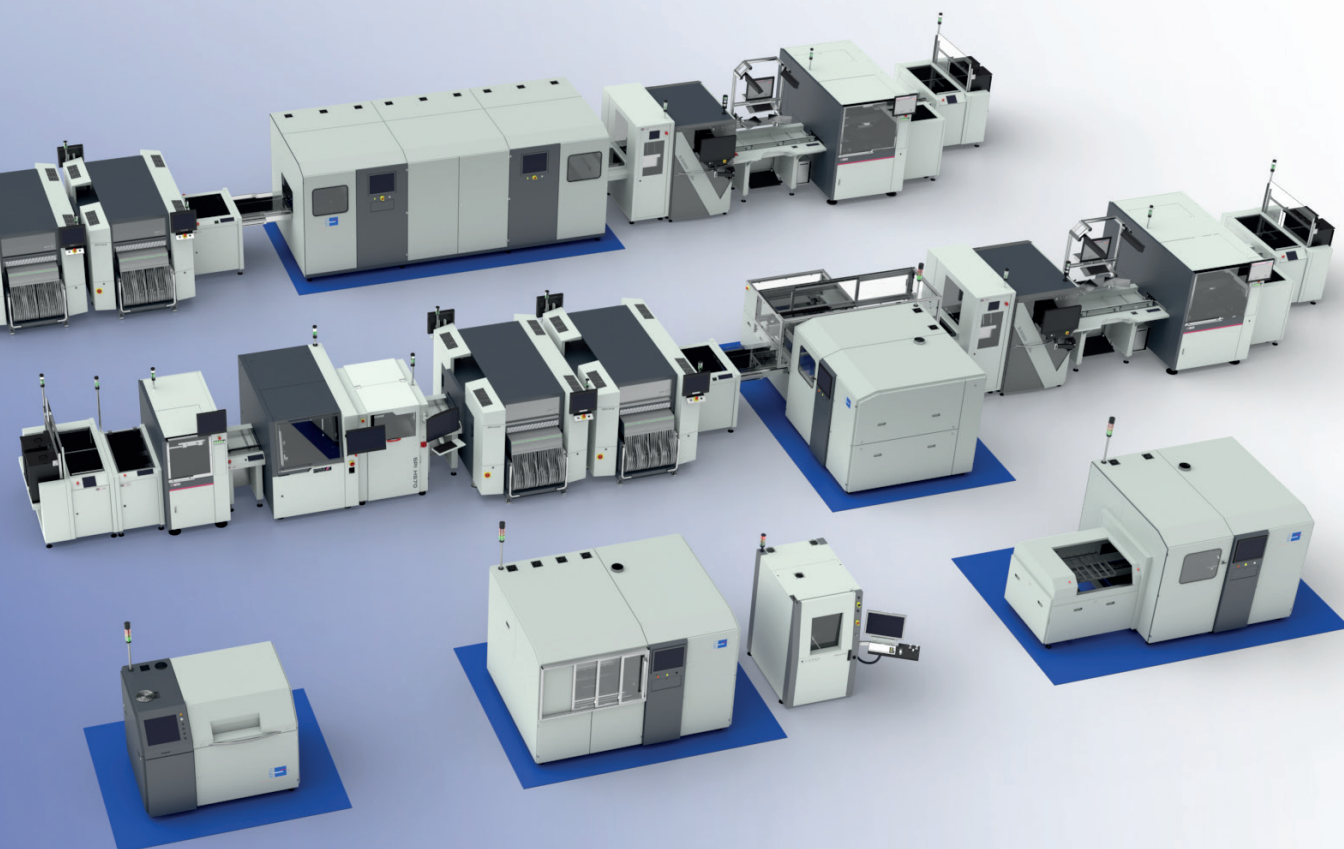
## 气相焊接系统 出色的环境兼容性

The Condenso series system versions can be integrated into a wide range of manufacturing environments. Whether it's a batch operation, inline connection or continuous soldering – Rehm offers the highest degree of process reliability for all areas!

The application options for the Condenso series are as varied as their production. We would be happy to determine the most efficient system for your manufacturing process, taking all relevant processes such as throughput, assembly size, thermal mass and follow-up processes into account.

Condenso系列气相焊接系统可轻松集成到各种生产环境，无论是批量处理、内联连接还是联机应用-锐德可以为所有领域提供更高可靠性的焊接制程！

该系列拥有无限的应用潜力，我们将充分考虑所有相关制程参数，例如产量、产品尺寸、热质量需求和后续制程，为您打造更高效的系统解决方案。



### › Patented injection principle – reproducible reflow profile

专利性注入原理——更高的温度曲线可复制性

### › Hermetically sealed process chamber

高密封性炉膛

### › Controllable vacuum process – Pre-vacuuming and vacuum feasible after soldering

可控的真空制程——预抽真空及焊接后真空

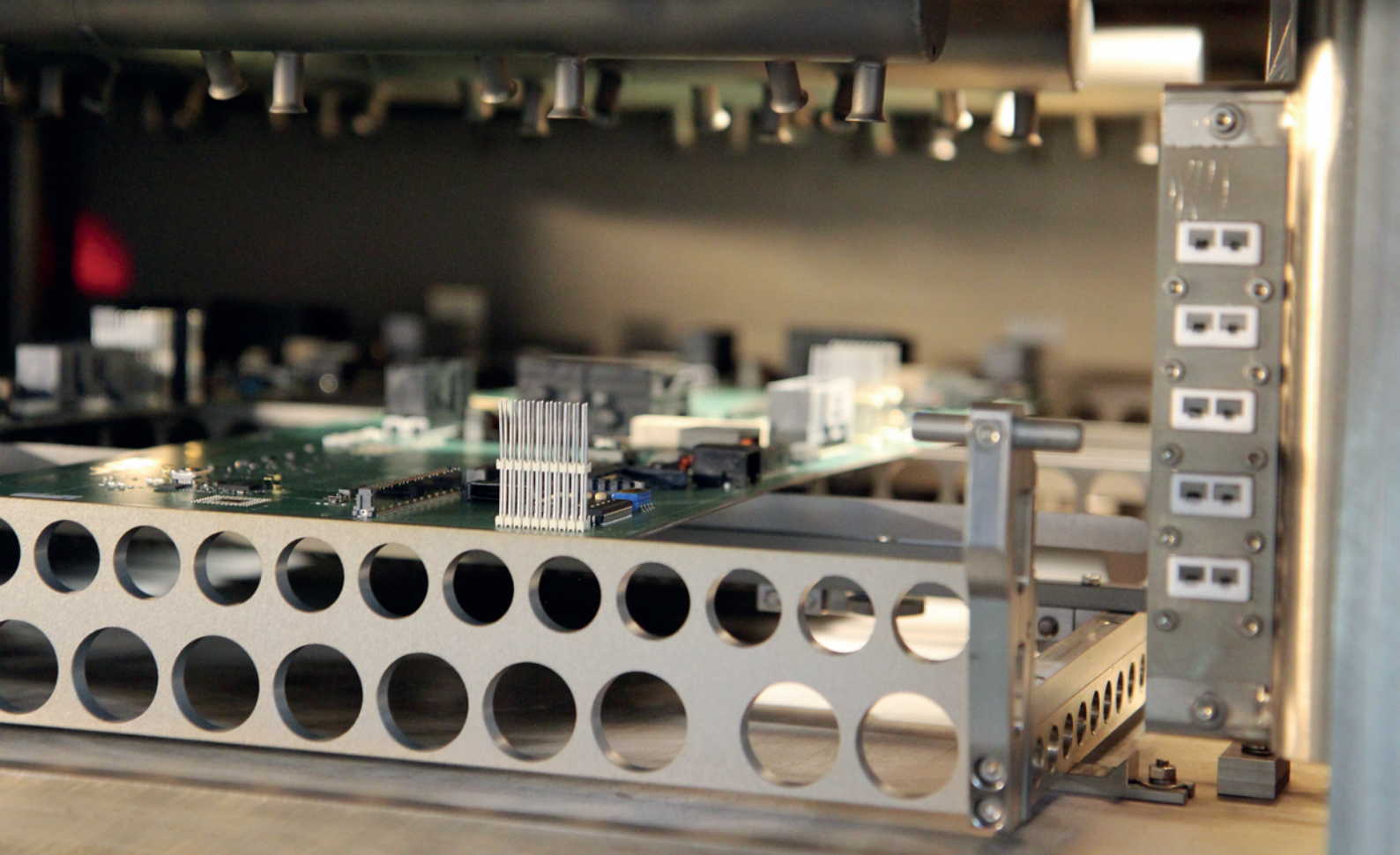
### › No Galden® spreading, active Galden® filtering

Galden®介质主动过滤，几乎无损耗

### › Process monitoring with a wireless WPS system (not with CondensoXC)

无线WPS系统，提供制程动态监控（不支持CondensoXC系统）





## Condenso – a patented principle with clear advantages

### 专利技术 优势显著

**With the Condenso series, a far greater amount of flexibility is available for the condensation soldering process than can be achieved with the conventional method. Using the injection principle and temperature and pressure (vacuum) control ensure more accurate and versatile reflow profiling.**

The soldering process takes place in a hermetically sealed process chamber. A film of fluid builds up during condensation soldering using the heat-conducting medium Galden®, which surrounds and vaporises the entire assembly. The steam condenses on the assembly until a soldering temperature of 240°C (e.g. when using HS240) is achieved. Galden® is a perfluoropolyether – fluid polymers that consist of carbon, fluoride and oxygen. Rehms applies a patented injection principle to improve control of the condensation phase. Exactly the right amount of Galden® is incorporated at the right time. Then, during this process, redundant, latent heat is used when changing the state of the medium from vaporous to fluid to evenly and steadily heat the assembly. The max. temperature of the assembly cannot exceed the max. boiling/condensation temperature of the medium to ensure the components don't overheat.

The temperature/reflow profile of the assembly can also be accurately adjusted by precise fluid volume control and intermediate steam extraction. Therefore, reproducible soldering conditions are ensured that increase process stability. A vacuum option is available with all Condenso systems for optimum results that are virtually void-free.

**与传统方法相比，Condense系列的凝热焊接工艺具有更大的灵活性。利用专利性介质注入原理对制程温度及压力（真空）进行调节和控制，能够获得更精确和更大范围的回流曲线。**

锐德利用注入原理极大地改善了对冷凝阶段的控制。整个焊接过程在完全封闭的炉膛内进行。在正确的时间通过加入适量的传导液Galden®（一种全氟聚醚流体聚合物，由碳、氟化物和氧组成）并进行蒸发处理，形成一层流体膜，包围整个组件并进行热量传导。在此过程中，蒸汽逐渐在组件上冷凝，从气态转变为液态，使组件受到均匀、稳定地升温，直至焊接温度达到240°C（例如使用HS240）。由于组件的最高温度受到介质的沸腾/冷凝温度限制，确保了电子元件不会因过热而导致损坏。

通过控制流体体积和蒸汽抽取可以精确地调节焊接温度曲线，因此，大幅提升了温度曲线的可重复性精度，确保了制程的稳定性。并且Condense系列均可配备真空选项，能够进一步实现无空洞焊接，达到理想的焊接效果。





## Hermetically sealed Process Chamber for soldering, vacuum and cooling

### 高度密封性炉膛

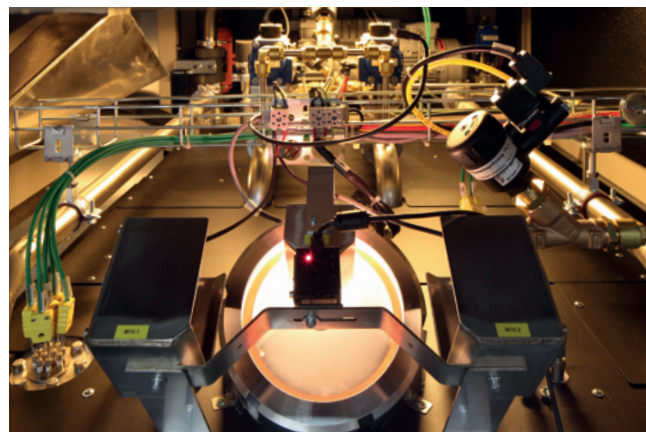
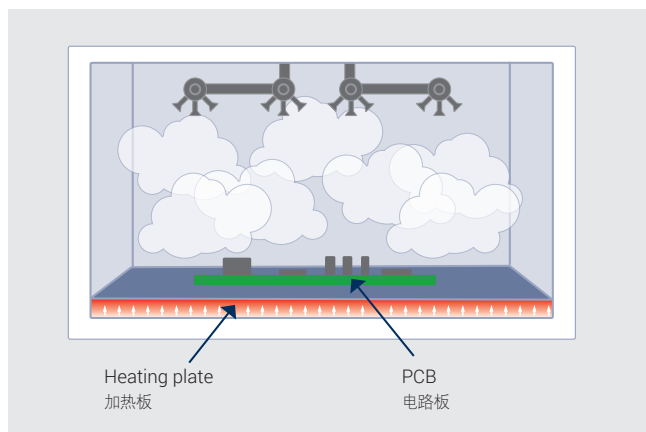
### 轻松应对焊接、真空及冷却制程

With all Condenso series systems, the soldering process takes place in a hermetically sealed process chamber made of aluminium or a mix of stainless steel and aluminium. The process chamber is fitted with high-quality electric panel heaters that ensure optimum process conditions. The assembly is heated up to soldering temperature by injecting and vaporising Galden®. Steam allows for optimum heat transfer to the soldering material. The heating systems' target temperature value remains constant. Therefore, excellent, reproducible soldering results are ensured. The Galden® is fully extracted after the soldering process, and air is blown in via a nozzle system to gently bring the assemblies

to lower temperatures before the actual cooling process. The systems can be optionally fitted with a viewing window or camera so that the soldering process can be observed and analysed. Soldering defects can be detected and eliminated in a timely fashion as a result.

Condenso系统采用由铝或铝合金制成的密封式炉膛，并配备高质量的面板加热器。通过介质Galden®的注入和蒸发实现热传导，从而将组件加热到目标焊接温度并保持恒定。确保了可重复的优质焊接结果。焊接完成后，传导液被完全提取出来，空气通过喷嘴系统进入炉膛，在冷却制程之前温和地降低组件温度。

该系统可以选装观察窗或摄像机，便于更加直观地观察和分析焊接过程，及时检测并消除焊接缺陷。



# Low medium consumption

## Resource-conserving and efficient

### 超低损耗 高效的资源节约型系统

After soldering, the assembly is passed onto the cooling process. Process gas is extracted and cleaned at the same time. Therefore, a large part of the Galden® can be reused – which is a solution that saves a great deal on materials, and is environmentally friendly! A vacuum is created during extraction which also ensures that soldering material is dried quickly.

锐德Condenso系列是一种高效的资源节约型解决方案。焊接完成后，组件进入冷却制程，同时对制程气体进行净化和提取，绝大部分的介质Galden®可以被回收并循环使用。在提取制程气体时还可以同时进行真空制程，从而加快组件的干燥速率。

The extracted Galden® is filtered and cleared of impurities using granules. Approx. 99.9 % of the medium can be recovered as a result. The cleaned fluid is made available in a container for other processes. "Loss of vaporisation" is low during soldering due to hermetically sealing the process chamber. As well as little need for maintenance, you benefit from low medium consumption, and save money as a result.

提取的Galden®经过特殊配方的过滤剂过滤并清除杂质后，进入回收罐并可供再次使用。由于采用了高度密封性的炉膛设计，焊接过程中产生的气化损失很低，因此传导液的回收率可高达99.9%。除了不需要维护外，极低的材料损耗也可以帮助用户节省使用成本。

#### › No loss of vaporisation in the process chamber

炉膛密封性优良，几乎无气化损失

#### › Medium filtering and re-use

介质可回收过滤并循环使用

#### › Environmentally friendly

清洁、环保、节约资源



Galden® storage container  
传导液回收罐



Filter granules  
过滤剂







## Why vacuum?

Reliable, reproducible soldered joints

为何选择真空？

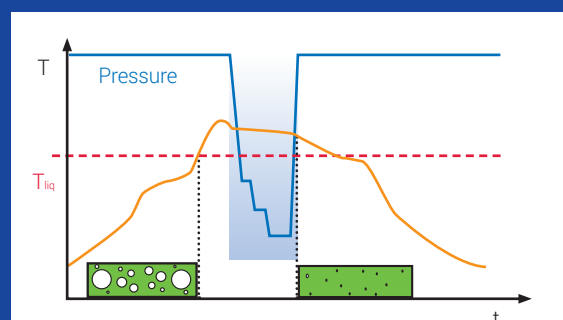
更可靠、更高重复精度的焊点

**Void-free (cavity-free) soldering with unleaded solders is an important requirement for manufacturing power electronics. However, lower void rates can only be achieved with soldering processes where the molten solder is subjected to a vacuum.**

The residues that remain in the soldered joint can escape more easily due to the vacuum. The Condenso series can be fitted with a vacuum pump as an option for this reason. You end up with soldered joints with a surface binding proportion of up to 99 %. Vacuum can also be drawn during the melt phase, even before the actual soldering process. This doesn't just allow the Galden® steam to be evenly distributed in the process area, but also enables the solvent and moisture to be de-gassed from the solder paste. In addition, the atmosphere can also be varied in the process chamber throughout the whole dwell time as well the temperature.

采用无铅焊料的无空洞焊接是电力电子制造的重要要求。然而，改善焊接工艺才是降低空洞率最有效的途径。只有在焊料处于熔融状态时进行真空制程，才能有效的将焊料里的气泡抽出来。

在真空状态下，焊点中的残留物更容易逸出，因此选装了真空单元的Condenso系列，可使焊点表面结合率高达99%。在焊接前预抽真空，能够让Galden®蒸汽分布得更加均匀；在焊接后再次抽真空，可以更高效地去除焊料中的溶剂和水分。在整个制程中，炉膛内的气体环境会随着温度和时间改变而变化。

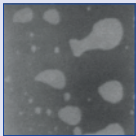

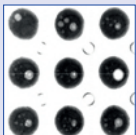
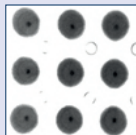


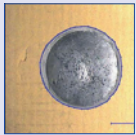
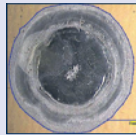


# Condenso vacuum technology for void-free results

## 真空技术 实现无空洞焊接

Condenso vacuum technology is used in a wide range of processes. Oxidation is reduced for drying and adhesive processes, and soldered joint reliability is increased during reflow soldering by reducing voids.

真空气相焊接技术被广泛应用于各种工艺，能够显著降低空洞率，且在干燥和焊接过程中减少了氧化，提升了焊点的可靠性。

Without Vacuum 非真空焊接		With Vacuum 真空焊接
	<b>Surface contacts up to 99 %</b> 焊点结合率高达99%	
	<b>Improved filling of micro vias and THD-solder joints</b> 改进了微孔填充及THD焊点	
	<b>Minimum of voids</b> (particularly important on power electronics) 最小化空洞率（对电力电子行业尤其重要）	
	<b>Improved wetting</b> 改善润湿性	

### › Pre-vacuum:

预抽真空

- **Prevention of oxidation, drying (solder paste, adhesives)**

防止焊料/粘合剂氧化、干燥，

- **Homogeneous Golden-gas-distribution (3-dimensional soldering)**

传导液蒸汽分布更加均匀（3D焊接）

- **Micro wave plasma (pre-cleaning)**

微波等离子（预清洗）

### › Vacuum during reflow soldering: Improved wetting

焊接过程中真空：改善润湿性

### › Vacuum after reflow soldering: Avoiding voids

焊接过程后真空：降低空洞率

# CondensoXC

## Optimal results with the smallest footprint

### 功能强大 节省空间

The CondensoXC is a space-saving, powerful system for laboratory applications, small series production and prototyping. Exact profiling by means of the injection principle and the option of soldering under an inert atmosphere provides the optimal soldering results. Void-free soldering can also be carried out easily with the vacuum option, which increases

Condensoxc不仅节省空间、而且功能强大，尤其适合于实验室应用、小批量生产和原型制作。通过注入原理和惰性气体制程环境，获得精确的回流曲线，提供最佳的焊接结果。也可以利用真空选项轻松实现无空洞焊接，从而进一步提高组件的可靠性。

the reliability of assemblies significantly.

With a footprint of just 2.3 m<sup>2</sup>, this system is specially designed for small series and is also ideal for prototype production. As a batch system, it can be used flexibly, irrespective of the production environment.

该系统占地面积只有2.3m<sup>2</sup>，是专为小批量生产而设计的，也是原型生产的理想之选。作为一个小型批处理系统，它的运用更加灵活，不受生产环境的限制。



#### ➤ Stable process for reliable results

制程稳定，焊点可靠

#### ➤ Process chamber for a maximum assembly size of 500 x 540 mm (W x L)

最大组件尺寸500 x 540mm

#### ➤ Camera for process observation (optional)

制程监控相机 (选配)

#### ➤ Patented injection principle

专利性注入原理

#### ➤ Vacuum process (optional)

真空制程 (选配)

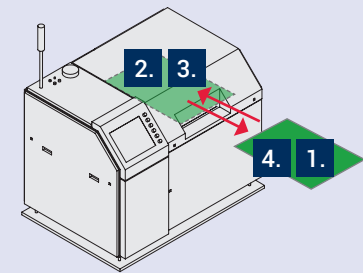


# Loading Concept

## The possibilities of CondensoxC

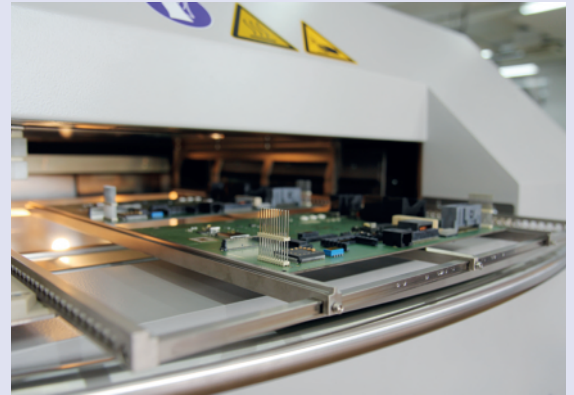
### 装载原理

#### CondensoxC系统应用



1. Loading
2. Soldering/Vacuum
3. Cooling
4. Unloading

1. 装载
2. 焊接/真空
3. 冷却
4. 卸载



### Handling | 装载



#### Front loading with pre-assembled product carriers

The CondensoxC is manually loaded with pre-assembled product carriers from the front on the operator's side. In this way, the assemblies can be easily placed on and removed from the interchangeable product carriers. The product carrier is on a rail system to ensure full access to the working area. Assemblies up to 500 x 540 mm (W x L) can be placed on the product carriers.

#### 前入式载具转载

CondensoxC需要操作员使用预装载具从正前方进行手动装载。这种方式便于组件在可互换的载具上进行安装和拆卸。荷载后的载具通过传输轨道进入炉膛。载具可适用组件的最大尺寸为500 x 540毫米。

### Gentle cooling | 平缓冷却

#### Gentle cooling processes by convection

After the soldering process, the assembly is cooled by convection to the required temperature. After cooling the bulkhead opens automatically and the product carrier can be completely pulled out on a rail for easy unloading. In addition, a water-cooled cooling zone is optionally available to enhance the cooling capacity.

#### 利用对流进行平缓冷却

焊接完成后，以对流方式将组件平缓冷却至所需温度。然后，炉膛舱门自动打开，将载具通过轨道手动拉出并进行组件卸载。除此之外，还可选配水冷冷却区，以增加系统冷却能力。



# CondensoXS smart

## Safe process due to injection

### 专利性注入 制程更安全

Depending on the choice of basic model, the CondensoXS smart can be loaded and unloaded manually or automatically. With both models, loading is carried out with pre-loaded product carriers that can hold assemblies up to 650 x 650 mm (W x L). In the case of manual loading, the product carriers are inserted from the side and removed in the same way. With the automated model, a handling device can be fitted to the infeed for automatic loading. On the operator's

根据所选择的设备基本型号，CondensoXS smart可使用预装载具进行手动或自动装卸。载具可容纳的最大组件尺寸为650 x 650 mm（宽x长）。在手动装载的情况下，载具从设备侧面插入并以相同的方式拆卸。在自动装载的型号中，可以将装卸模块安装在进料口用于自动装

side, there is also the option to position the assemblies on the product carrier or remove them from it when it has already been inserted.

Flexible cooling options, a vacuum and the injection principle also ensure reliable processes with this model in a partially automated production environment with a medium-size production volume.

载。在操作员这边，还可以选择将组件放置于载具上，或者在已经插入时将它们从载具上移除。

灵活的冷却选项、真空制程和专利性注入原理确保了该型号的工艺可靠性，并完全可以满足中等规模的部分自动化生产需求。



#### > Manual or alternatively automatic loading

手动或自动装载

#### > Flexible cooling inside and outside the process chamber (within optional)

制程炉膛内外均可灵活冷却（可选）

#### > Process chamber for a maximum assembly size of 650 x 650 mm

制程炉膛可支持的最大组件尺寸为650 x 650 mm

#### > MES and traceability solutions (optional)

MES及可追溯性解决方案（可选）

#### > Touch user interface

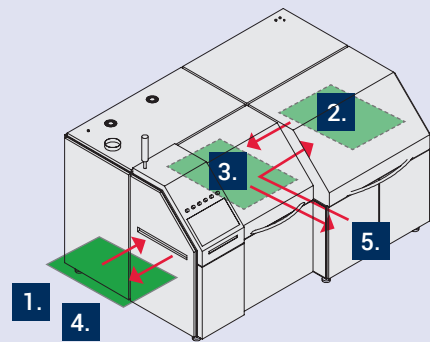
触屏操作界面

# Loading Concept

## The possibilities of CondensoXS smart

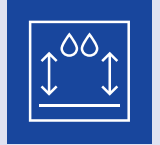
### 装载原理

#### CondensoXS smart系统应用

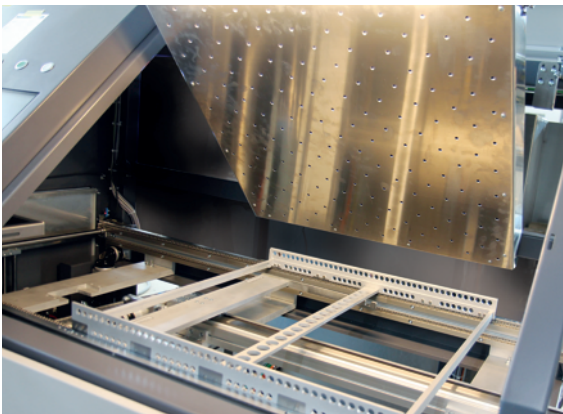


1. Loading assembled workpiece carrier
2. Soldering/Vacuum/Cooling under Liquids
3. Unloading
4. Unloading workpiece carrier
5. Manual loading / unloading of single PCB's

1. 加载预装载具
2. 液相线下焊接/真空
3. 卸载
4. 卸载载具
5. 手动装载/卸载单个PCB



### Cooling | 冷却



#### Flexible cooling process achievable

Various cooling processes can be used, depending on requirements. The system is equipped with air cooling in the cooling section as standard. Cooling is also possible inside the process chamber under liquid either with or without nitrogen. For particularly large and heavy boards, water cooling is also recommended for the cooling section. This allows cooling to take place from the underside, too. Flexible cooling gradients can thus be achieved.

#### 灵活的冷却制程

根据需要，多种冷却制程可供选择。该系统的冷却单元标配为风冷。也可在有/没有氮气的情况下，在制程炉膛内进行液相线冷却。对于超大和超重的电路板，建议使用水冷，从下方对电路板进行冷却。因此可以实现更灵活的冷却斜率。

### Handling | 装载

Loading with product carriers can be carried out manually or automatically. The basic product carrier is designed for a max. surface load of 5 kg. Adjustable LP edge supports (max. 5 kg surface load) and an adjustable centre support (max. 5 kg surface load) are available as options. For particularly heavy assemblies, the surface load can be increased from 5 kg to a maximum of 15 kg as an option.

载具可使用手动或自动装载。标配载具的最大表面负荷为5kg。可支持选配LP可调边缘支架（最大表面负荷5kg）和可调中心支撑（最大表面负荷5kg）。

对于特别重的组件，可选配最大表面负荷15kg的载具。





# CondensoXM smart

## Inline system for automated processes

### 联机应用 自动化制程

The CondensoXM smart can be integrated into any production environment. You can install the system as an island solution for several production areas and load it manually. Alternatively, upstream handling systems can be used to automate loading. This reduces cycle times and ensures the optimal soldering results even with larger volumes.

CondensoXM smart可以集成到任何生产环境中。不仅可以采用手动加载模式，将其作为多个生产区域的独立解决方案。还可以利用上游处理系统来自动加载，实现自动化联机应用。在缩短生产周期的同时，确保更优化的焊接效果，实现产能提升。

Flexible cooling options inside and outside the process chamber – with and without nitrogen – guarantee optimal cooling rates and the correct temperature for downstream production processes such as x-ray inspection or functional testing. Virtually void-free soldering results can also be achieved with the vacuum option.

工艺炉膛内外均有灵活的冷却选项可供选择——有氮气和无氮气。能够确保下游生产制程（如X射线检查或功能测试）的最佳冷却速率和正确温度。此外，该系统还可以搭载真空单元，实现无空洞焊接制程。



#### ➤ During the process a visual inspection is possible

制程中可启用视觉检查

#### ➤ Manual, alternatively automated loading and unloading of pre-assembled product carriers

支持手动、自动装/卸载预装载具

#### ➤ Process chamber for a maximum assembly size of 650 x 650 mm

可支持的最大组件尺寸为650 x 650 mm

#### ➤ Process Galden® injection and filtering in a closed loop

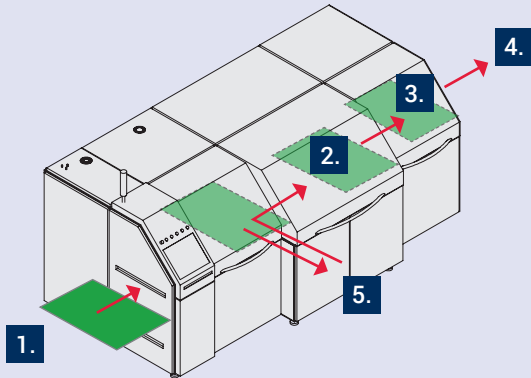
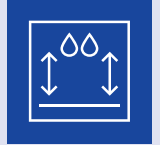
采用闭环原理对介质Galden®进行注入与过滤

# Loading Concept

## The possibilities of CondensoxM smart

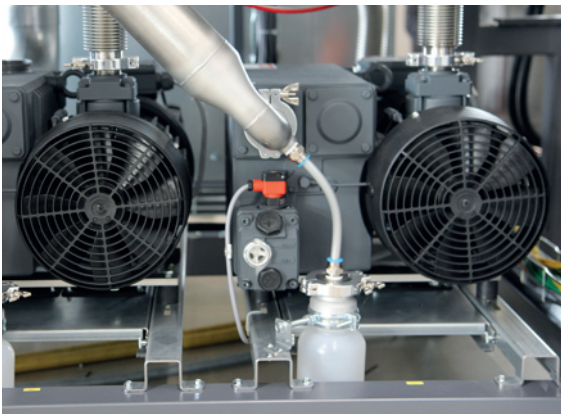
### 装载原理

#### CondensoxM smart系统应用



1. Loading assembled workpiece carrier
  2. Soldering/Vacuum/Cooling under Liquidus
  3. Unloading
  4. Unloading workpiece carrier
  5. Manual loading / unloading of single PCB's
1. 加载预装载具
  2. 液相线下焊接/真空
  3. 卸载
  4. 卸装载具
  5. 手动装载/卸载单个PCB

### Vacuum pump | 真空泵



The CondensoxM smart can be equipped with an additional vacuum pump. This increases reliability, which is necessary in particular for critical assemblies which make increased demands on the vacuum process. Moreover, two vacuum pumps can be used to reduce the cycle time and thus increase productivity for vacuum applications under 10 mbar in particular. The option of a second vacuum pump is also available with the CondensoxS smart, CondensoxS smartline and Condensox Line models.

CondensoxM smart可配备额外的真空泵。从而进一步提升焊接可靠性，这对于真空工艺需求更高的关键组件而言尤为必要。双真空泵还可以减少生产循环周期，从而提高生产效率，特别是10mbar以下真空应用的生产率。此外，CondensoxS smart、CondensoxS smartline和Condensox Line系统均可支持选装双真空泵。

### Software | 软件

With ViCON Condensox, Rehms offers a clear software package for the Condensox series that is intuitive to use with its touch-screen interface. All messages, commands and parameters are visible at a glance on the main screen with its machine view. Simple profiling with clearly structured process stages is therefore possible – with or without the vacuum option. With numerous other features, such as a favourites bar that can be set up as required, structured grouping of parameters and individual process monitoring and documentation, ViCON offers you optimal support for your manufacturing processes.

ViCON Condensox是锐德为Condensox系列定制的软件方案。除了更直观的触屏界面，所有消息、命令和参数均可在主屏幕机器视图上一览无余。无论有无真空选项，都可以获取结构清晰的制程阶段曲线分析。此外该软件还拥有众多其他功能，如个性化收藏栏、结构化参数分组以及独立的制程监控和文档记录，均可为生产制程提供最佳支持。



# Condenso smartline

## Ideal for series production of power electronics

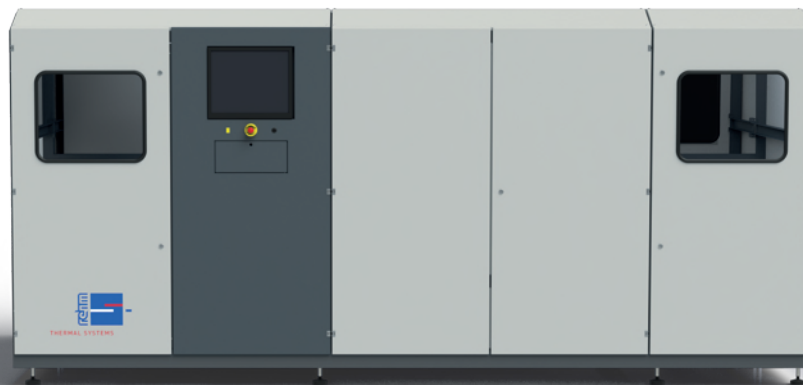
### 理想之选 电力电子批量化生产

The Condenso smartline is designed for a production environment that requires a fully automated inline connection. Loading is carried out directly from the feed conveyor in front of the system. The soldering process takes place in the process chamber, which can be flooded with nitrogen. If cooling under liquid is required, this can be integrated into the process chamber as an option. After the soldering process, the product carrier is moved into the cooling zone and the

Condenso smartline专为完全自动化内联式生产环境而设计。可直接利用位于系统前方的进料传输带进行自动装载。满载的载具进入充满氮气的工艺炉膛内进行焊接制程，该炉膛可选配液相线下冷却选项。焊接完成后，载具随即进入冷却区。组件在该区域内被冷却至最佳温

assemblies are cooled down to the optimal temperature. The assemblies are then removed automatically onto a downstream conveyor belt. The empty product carrier is moved back to the loading area in the system. With the advantages of the inline condensation soldering process, a high throughput and the integrated product carrier return, the Condenso smartline meets the highest demands of series production in power electronics.

度。冷却后的组件从载具上被自动卸载到下游的传输带上。空的载具则自动返回系统的装载区域。利用Condenso smartline的内联式凝热焊接工艺、集成式载具循环传输设计以及更高的吞吐量等优势，该系统是满足电力电子批量生产最高要求的理想之选。



#### > Inline system with integrated goods carrier return transport

配备集成式载具循环传输的内联式系统

#### > Fast product change possible

产品快速切换

#### > Traceability and MES connection

可追溯性及MES连接

#### > Inert process atmosphere during the soldering process

惰性气体焊接制程

#### > No Galden® carryover, active Galden® filtering

介质Galden®主动过滤，绝无残留

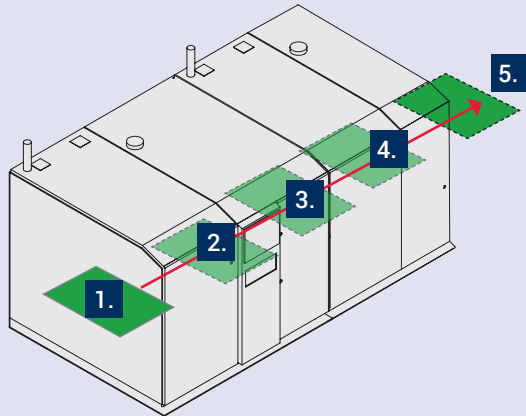
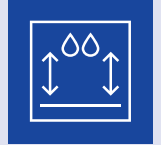


# Loading Concept

## The possibilities of Condensosmartline

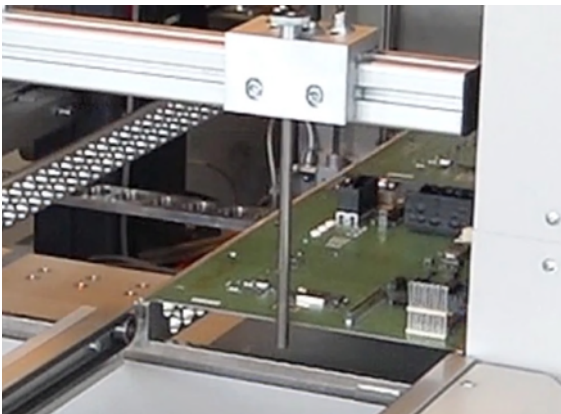
### 装载原理

#### Condensosmartline系统应用



- |                     |          |
|---------------------|----------|
| 1. Loading          | 1. 装载    |
| 2. Inlet area       | 2. 入口区域  |
| 3. Soldering/Vacuum | 3. 焊接/真空 |
| 4. Cooling          | 4. 冷却    |
| 5. Unloading        | 5. 卸载    |

### Automatic Loading | 自动装载



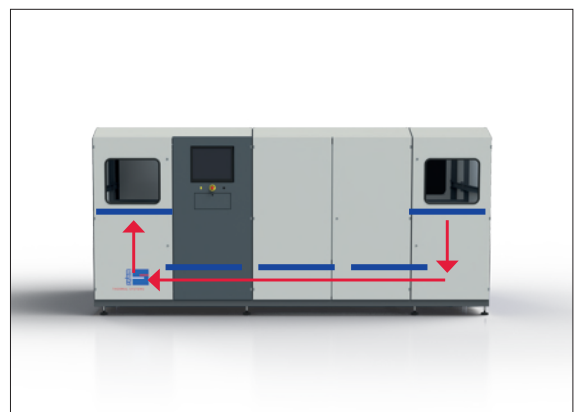
The Condensosmartline works with a pusher for loading the product carriers already in the system. The assemblies are pushed from a feed conveyor onto the product carrier. The product carrier can be equipped with a centre support for each track. A maximum of 6 tracks are possible on each product carrier. The max. assembly size is 650 x 650 mm. Unloading of the product carriers is also carried out with the pusher, which moves them onto the downstream conveyor belt.

Condensosmartline搭载了推送装置，能够将组件从进料传输带上推入系统内的预装载具上。载具的每条轨道上均可配中央支撑。每个载具最多可搭载6条轨道。可支持的最大组件尺寸为650 x 650 mm。在卸载时，同样利用推送装置将组件推入下游传输带上。

### Internal carrier return transport | 内置载具循环传输

The product carriers in the Condensosmartline are moved internally from the unloading area back to the loading area. As a result, no additional magazine modules or external product carrier systems are required in the area around the system. This saves space and also reduces the amount of contamination of the product carriers thanks to the closed loop system, thereby ensuring that little servicing work is required and downtimes are reduced.

组件卸载完毕后，载具在Condensosmartline内部从卸载区返回至装载区。因此，不需要在系统周围设置额外的料仓组件或外部承载装置。由于该系统采用了闭环设计，不仅能节省占地空间，还有效地降低了载具的污染风险，减少了维护工作量及停线时间。



# CondensoX-Line

## Reliable and repeatable

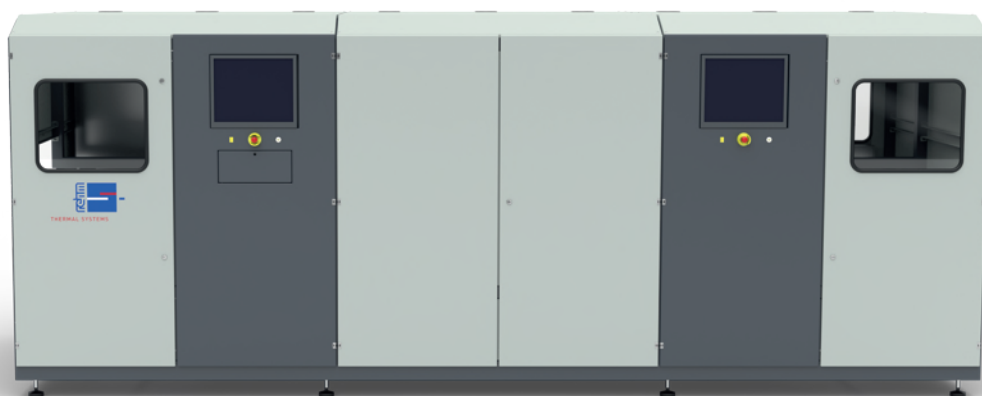
**值得信赖 更高的可复制精度**

The CondensoX-Line enables vacuum condensation soldering processes to be easily integrated into standard SMD lines. This allows void-free solder joints to be manufactured in a completely inert process environment (<100ppm O<sub>2</sub>), whether they are standard modules with BGA devices or DCB substrates for power electronics.

通过CondensoX-Line系统，能够将真空凝热焊接工艺轻松集成至标准的SMD产线。无论是带有BGA器件的标准模块还是用于电力电子的DCB基板，均可在完全惰性的工艺气体环境下(<100ppm O<sub>2</sub>)进行生产并获得无空洞焊点。

By building a 3-chamber system, low cycle times can be achieved for inert soldering processes. The final gas-tight cooling chamber provides for controlled and rapid cooling of the assemblies by means of adjustable convection with less than 100 ppm residual oxygen in the atmosphere. The CondensoX-Line meets the highest demands of mass production in the power electronics.

通过构建3腔式系统，可明显缩短惰性焊接工艺的生产周期。末端的气密冷却区在残氧量低于100 ppm的环境下，通过调节对流速率来控制组件的冷却制程。因此，CondensoX-Line完全能够满足电力电子批量化生产的最高要求。



### ➤ Ideal for the processing of massive assemblies (IGBT, Heatsinks)

适用于大型组件(IGBT, 散热器)的加工

### ➤ Reliable condensation soldering process for SMD manufacturing in a continuous process

可靠的凝热焊接工艺，适用于SMD的连续生产

### ➤ Horizontal transport of the modules of the entire process

整个工艺制程均保持可靠的水平传输

### ➤ Inert process atmosphere during the entire soldering process

惰性气体焊接制程

### ➤ Cooling section can be used with <100ppm residual oxygen

冷却区残氧量低于100ppm

### ➤ Void-free soldering with the use of vacuum for best results

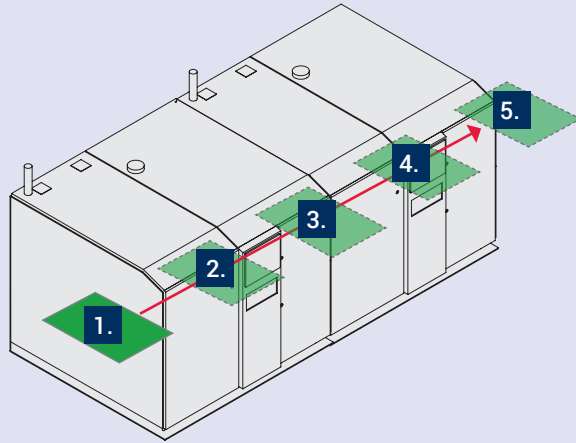
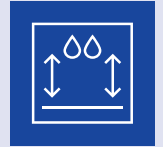
真空焊接，实现更优化的焊接效果

# Loading Concept

## The possibilities of Condensox-Line

### 装载原理

#### Condensox-Line系统应用



1. Loading
2. Pre-chamber/Pre-inerting
3. Soldering/Vacuum
4. Cooling
5. Unloading

1. 装载
2. 预压室/预惰性化
3. 焊接/真空
4. 冷却
5. 卸载

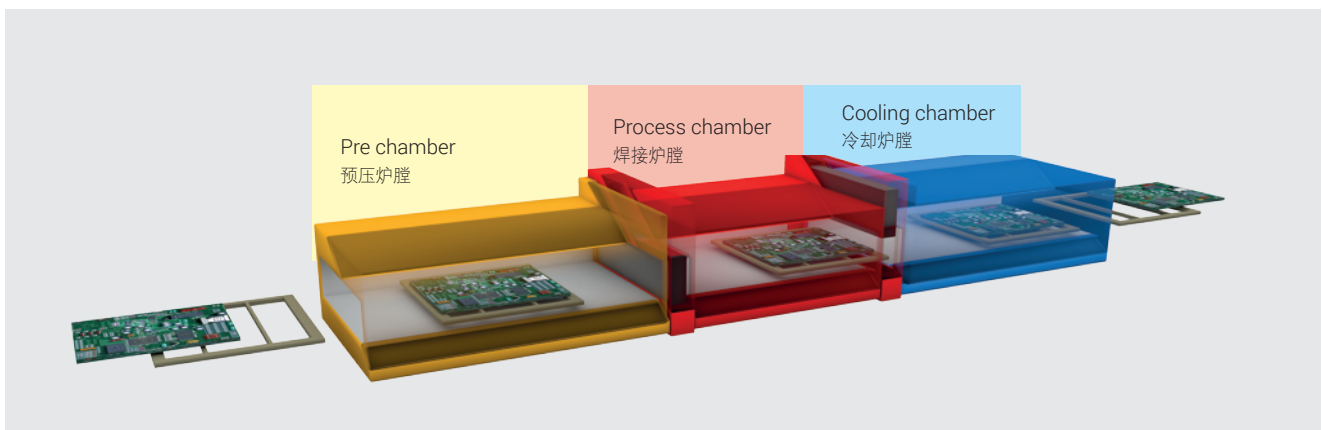
### 3-chamber system | 三腔式炉膛

The Condensox-Line is set up as a 3-chamber system to achieve low cycle times with inline soldering processes. The first chamber provides a protective nitrogen atmosphere for the products (pre-inerting) before it is transported to the actual soldering process. The second process chamber that is suitable for vacuum can be flooded with nitrogen or forming gases and provides an inert or activating and void-reducing process atmosphere throughout the whole soldering process. In addition, formic acid can be used as an option here

Condensox-Line采用三腔式炉膛，通过内联式焊接工艺缩短了生产周期。一号炉膛在组件进入焊接过程之前为其提供保护性氮气环境（预惰性化）。二号炉膛可适用于真空焊接，在充入氮气或合成气体后，为焊接制程提供惰性或活化性的工艺气体环境，以降低焊接空洞率。此外，这也是世界上首创的，可以利用甲酸进行无焊剂焊接制程的

for flux-free process control – which is a first in the world of vapour phase soldering systems! Controlled, rapid assembly cooling can be achieved with less than 100 ppm residual oxygen in the atmosphere using controllable convection in the final, gas-tight cooling chamber. In this way, void-reduced soldered joints can be made in a completely inert process environment, irrespective of whether this is with standard assemblies with BGA components or a DCB substrate for power electronics.

气相焊接系统！位于末端的气密冷却区，能够在残氧量低于100ppm的环境下，通过调节对流速率来实现可控的、快速的组件冷却制程。通过这种方式，无论是带有BGA器件的标准模块还是用于电力电子的DCB基板。均可在完全惰性的工艺气体环境下(<100ppm O<sub>2</sub>)进行生产并获得无空洞焊点。



Construction of the 3-chamber system of the Condensox-Line  
Condensox-Line三腔式炉膛结构



## Innovative software

### Big data and process management

#### 创新的软件系统

#### 大数据及制程管理

**Integrating highly specialised software in modern manufacture will become more and more common in future. Systems and processes are managed, monitored, analysed and optimised. The order, product data, efficiency and status data, specified settings, archived profiles and current values are incorporated into the machine control system product documentation and analysis.**

With ViCON Condenso, Rehm offers a clear software package for the Condenso series that is intuitive to use with its touchscreen interface. All messages, commands and parameters are visible at a glance on the main screen with its machine view. Simple profiling with clearly structured process stages is therefore possible – with or without the vacuum option.

With numerous other features, such as a favourites bar that can be set up as required, structured grouping of parameters and individual process monitoring and documentation, ViCON offers you optimal support for your manufacturing processes.

**在现代制造业中集成入高度专业化的软件即将变得越来越普遍。利用这些软件不仅可以对系统和流程进行管理、监控、分析和优化。还能够对订单、产品数据、效率和状态数据，特定的设置、配置文件存档和当前状态值纳入到设备控制系统产品文档和分析。**

借助ViCON Condenso，锐德为Condenso系列搭载了清晰易用，可通过触屏界面操作的软件工具包。通过主界面上的设备视图，所有信息、命令和制程参数皆一目了然。无论有无真空选项，都可以获取结构清晰的制程阶段曲线分析。此外，该软件还拥有众多其他功能，如个性化收藏栏、结构化参数分组以及独立的制程监控和文档记录，均可为生产制程提供最佳支持。



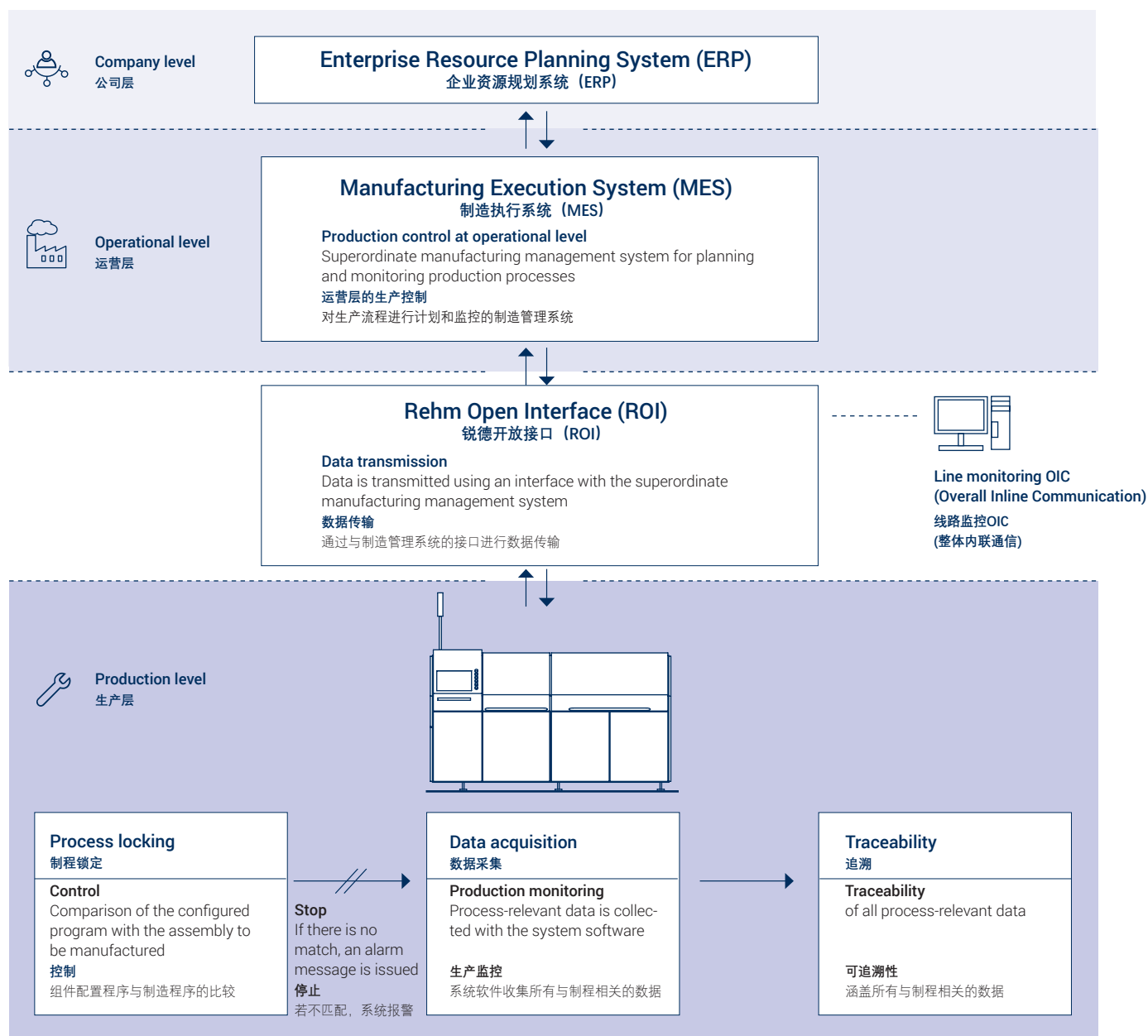
## Process documentation, traceability & co. | 制程记录、追溯和归集

The variety of MES systems on the market requires individual adjustment of data transfer from the Rehm reflow soldering system to the client's superordinate manufacturing management system (MES). Superordinate to this is the ERP system, which the whole company looks at, and which allows for logistic optimisations across all sites. However, the MES system focuses on a company's individual production lines. Rehm uses an ROI interface (Rehm open interface) to transfer individual data. Machine-specific operational data that is due for the respective system is collected and passed onto the MES system as a bundle. It is possible

市面上的MES系统种类繁多，需要对锐德回流焊系统与客户的制造管理系统(MES)之间的数据传输进行单独调整。在此系统之上的则是关注公司全局，允许跨部门进行流程优化的ERP系统。然而，MES系统的重点在于各条生产线。锐德使用ROI接口(开放接口)来传输单个数据。并收集相应系统的特定操作数据，将其作为一个数据包传递到MES系统。通过这种方式，可以确保产品、组件或批次数据的可追溯

to ensure the seamless traceability of products, components or batches in this way. A data set is created for every assembly, which documents the relevant process parameter during the run. The assembly can be clearly identified and assigned via a barcode scan on the assembly itself, or by scanning the batch card. Process locking is also available as an option. Here, the scan is compared with the database and the assembly is only transported to the system in the event of approval. Defects can be detected and prevented in this way and therefore lead to process improvements.

性。每个组件都会产生一个记录运行期间相关制程参数的数据集。通过扫描组件本身的条形码，或批号卡，系统可以清楚地识别和分配组件。工艺锁定作为一个可选项，能够将扫描数据与数据库进行比较，并且仅在获得批准的情况下将组件传输到系统中。通过这种方式可以对缺陷进行检测和预防，并因此改进制造工艺。



# Accurate profiling capability

## 3 steps to a profile – 5 steps with vacuum

### 精准的分析能力

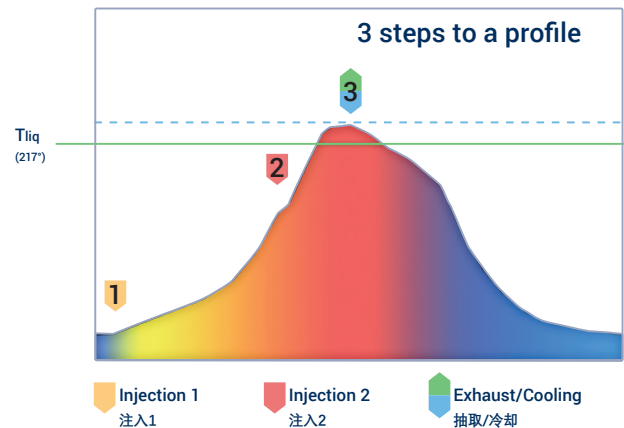
#### 3步/5步 (真空) 成型温度曲线

##### Only 3 steps to a profile | 3步成型温度曲线

This makes profiling simple! With the Rehm Condenso series, you only need three steps to create an optimum profile for your assembly. What's more, the possibilities are endless for further refining and adjusting your profile, depending on your requirements. However, the following steps are usually enough to reach the optimum temperature profile for your application:

使用锐德 Condenso系列，分析将变得更加简单！只需要三步即可为组件创建最佳的温度曲线。并且能够根据您的要求，进一步调整和精细化已设置的温度曲线。通常情况下，根据以下步骤足以达到应用程序的最佳温度曲线：

- 1. Injection of the Galden® | Pre-heating of the PCB**  
注入Galden® | PCB预热
- 2. Injection of the Galden® | Ideal soldering temperature**  
注入Galden® | 理想的焊接温度
- 3. Exhaust of Galden® | Cooling**  
抽取Galden® | 冷却

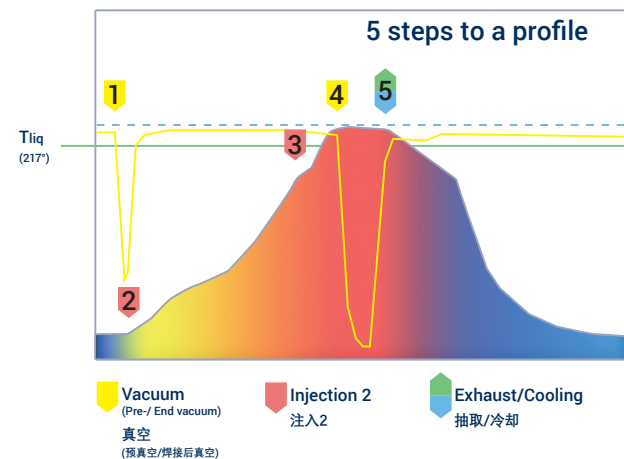


##### 5 steps with vacuum | 5步 (真空) 成型温度曲线

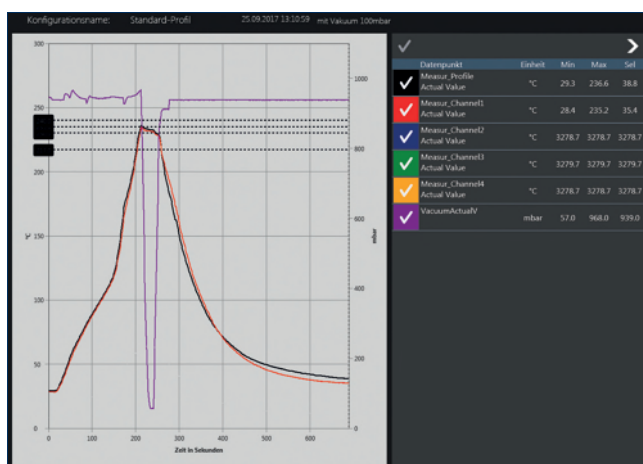
A pre-vacuum doesn't just allow the Galden® steam to be evenly injected, it also enables solvents and moisture to be de-gassed from the solder paste. After the max. soldering temperature has been reached, the gases that are still present can escape from the solder paste more easily using an end vacuum. Surface binding of up to 99 % occurs as a result.

预真空不仅能使Galden®蒸汽均匀注入，还能有效去除焊锡膏中的溶剂和水分。在达到峰值温度后，继续采用真空可以使焊锡膏中的残留气体进一步逸出，从而获得表面结合度可高达99%的优秀焊点。

- 1. Pre-vacuum | Uniform distribution of the Galden®**  
预真空 | 使Galden®均匀分布
- 2. Injection of the Galden® | Pre-heating of the PCB**  
注入Galden® | PCB预热
- 3. Injection of the Galden® | Ideal soldering temperature**  
注入Galden® | 理想的焊接温度
- 4. Vacuum during the melting phase | Void-free solder joint**  
熔融阶段真空 | 无空洞焊点
- 5. Exhaust of the Galden® | Cooling**  
抽取Galden® | 冷却



## Rehm Recorder | 锐德记录器



All Condensio systems are fitted with the Rehm recorder. The documentation tool replaces external temperature recorders and records relevant process data such as temperature and pressure. Data collection and traceability are carried out at an unprecedented level – without having to interrupt production. This is how soldering profiles are accurately recorded and can be called up and reproduced every time by series production. The measured values can be shown graphically with the Rehm recorder and can therefore also be documented and compared.

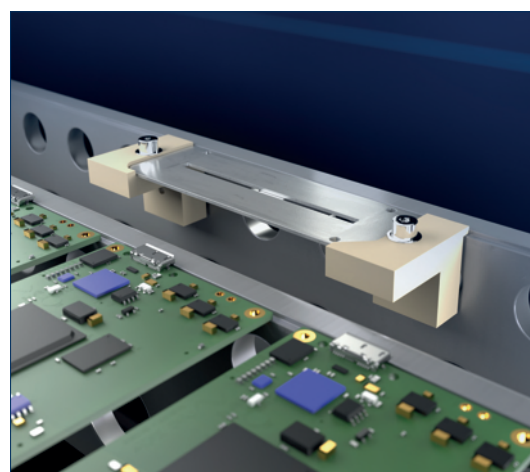
所有Condensio系统都装有锐德记录器。采用文档化工具取代外部温度记录器，记录温度、压力等相关制程数据。数据收集更加高效可靠，数据记录的可追溯性也更强，且不需要中断生产。除了准确记录焊接曲线，还可随时调出记录并复制性批量生产。测定值可以用锐德记录器以图形进行显示，记录和比较。

## WPS 2.4 – Wireless Profiling System | 无线分析系统

The WPS 2.4 is a brand-new, wireless measuring system which is used to continuously control the temperature profile. It consists of a sensor with antennas, as well as a wireless and evaluation unit. The temperature sensor is directly attached to the workpiece carrier. It works passively and doesn't require an external energy supply. A complete soldering profile can be determined and transferred to the system software in real-time, without any annoying cables or batteries. Software-aided documentation and evaluation functions (Rehm Recorder) allows for a new, complete traceability level.

WPS 2.4是一种全新的，用于连续控制温度曲线无线测量系统。包括一个带有天线的传感器，一个无线评估单元。温度传感器直接安装在载具上。该系统无需繁琐的电缆及电池等外部能源供应。可以将确定的温度曲线完整并实时地传输到系统软件中。软件辅助文档和评估功能（锐德记录器）将系统提升到一个全新的、更加完整的可追溯性水平。

- › **100 % process monitoring**  
100%制程监控
- › **Simple, continuous proof of quality**  
简单、持续地品质验证
- › **Stable sensor function without cables or a battery**  
传感器功能稳定，无需任何电缆或电池



Workpiece carrier with temperature sensor in loading position  
在装载位置带有温度传感器的工件托架

### › Optimal process control with the ViCON Condensio

ViCON Condensio具备更优化的制程控制

### › Traceability of all process-relevant data

数据可追溯性涵盖所有与制程相关的数据

### › Process monitoring via WPS 2.4 and a Rehm Recorder

通过WPS 2.4和锐德记录器进行制程监控

### › Reliable process documentation and maintenance history

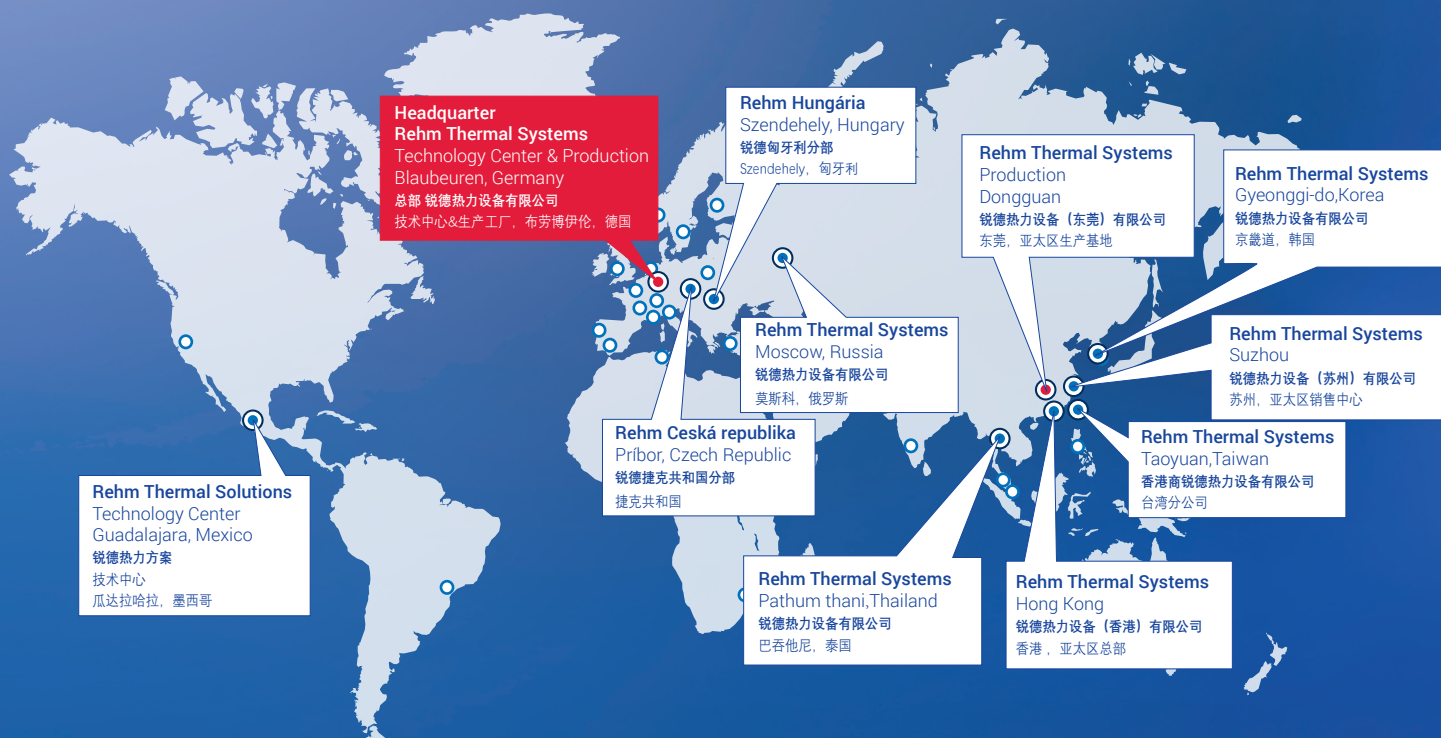
可靠的制程记录归档和维护日志

### › Connection to a superordinate Manufacturing Management System (MES)

与上级制造管理系统（MES）相连接



THERMAL SYSTEMS



## Rehm Worldwide 锐德全球

As a leading manufacturer of innovative thermal system solutions, we have customers on every continent. With our own locations in Europe, America and Asia, as well as 26 agencies in 24 countries, we are able to serve the international markets quickly.

作为世界领先的创新型热力系统解决方案制造商，我们的客户遍布全球每一块大陆。锐德在欧洲、美洲、亚洲均设立了技术中心和生产工厂，同时还在24个国家和地区拥有26家代理商，能够快速响应国际市场的各种需求，为客户提供最出色的现场服务。

- 分公司
- 生产基地
- 服务支持

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