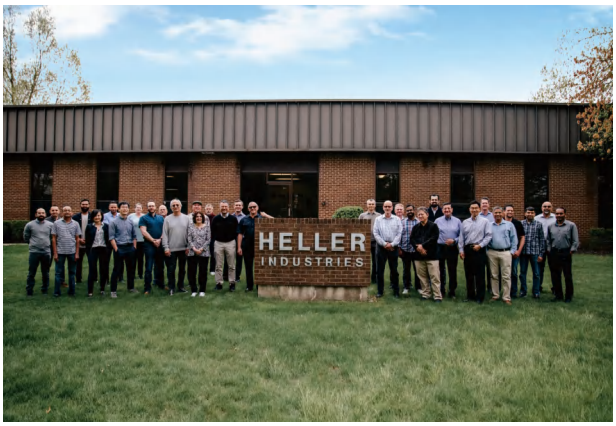
HELLER
INDUSTRIES

HELLER VACUUM REFLOW OVEN
真空回流炉

满足低空洞率焊接与高产能需求

www.hellerindustries.com

HELLER——
LEADER IN THERMAL PROCESS SOLUTIONS
热处理解决方案的领先者



HELLER US 美国

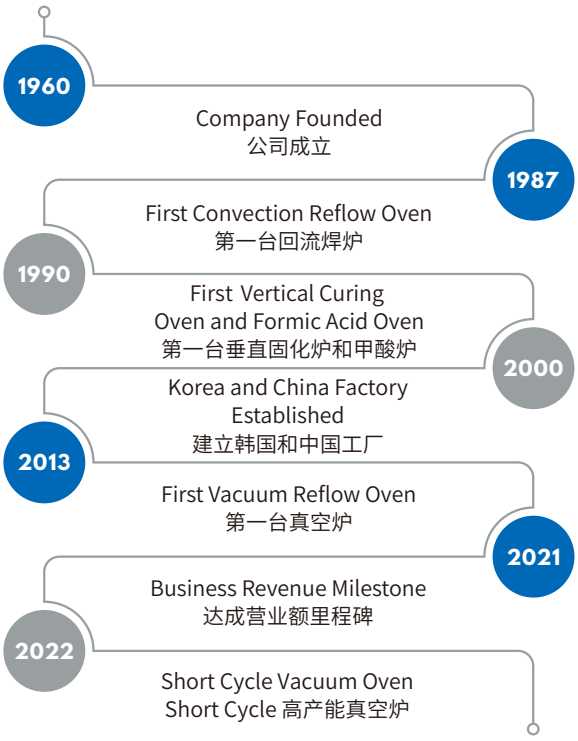
HELLER KOREA 韩国


HELLER CHINA 中国

MARKET LEADER - HELLER Industries was founded in 1960, pioneered convection reflow soldering in the 1980s, and has been at the forefront of innovation ever since. HELLER partners with customers to continually refine systems to meet today's advanced applications requirements. By embracing challenge and change, HELLER has earned the position of World Leader in Thermal Process Solutions.
市场领先者——HELLER Industries 公司成立于1960 年，并在 1980 年代率先采用对流回流焊技术，并自此一直处于创新前沿。 HELLER 与客户合作，不断改进系统，以满足当今先进制程和应用的要求。 通过迎接挑战和变化，

TECHNOLOGY LEADER - With the largest Engineering team in the industry, HELLER continuously invests resources in research and development to keep its technology ahead of the market, empowering its customers for future applications and challenges.
技术领先者——HELLER拥有行业中强大的工程团队，不断投入研发资源，以保持其技术领先地位，为客户的未来应用和挑战做好准备。

A CULTURE OF CUSTOMER FOCUS - HELLER is committed to providing its customers the best possible solution for their applications through fully configurable and customized products to meet their unique requirements and give them the competitive advantage they require.
以客户为中心的文化——HELLER通过完全可配置和定制化的产品，致力于为客户提供适合其应用制程的解决方案，以满足其独特的要求，增强其竞争优势。



WHY PARTNER WITH HELLER?
为什么与HELLER合作?

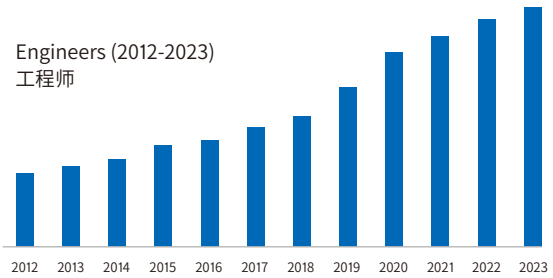
Market Leader 市场领先
Presenting in Soldering and Curing Systems for SMT and Semicon.
Worldwide Footprint - Be Global and Local ("Glocal").
SMT和半导体的焊接和固化应用市场,
全球足迹 - 全球化和本地化("Glocal")

Advanced Technology 先进技术
Partnering with Leading Companies to Drive New Manufacturing Technology and Helping Their Competitive Advantages.
与领先企业合作,推动新的制造技术,帮助创造竞争优势。

Strong Capability 能力雄厚
Being Able to Innovate and Customize Quickly, Easy to Work With.
针对应用制程提供快速创新和定制方案,易于使用。

Green Technology 绿色科技
Environmentally Conscious / Sustainability Focus and Designs.
关注绿色环保/可持续发展的设计。

A Continuous Investment in Engineering Manpower Drives the Technology . . .
研发人力资源的持续投资推动了技术进一步发展



2020 Global Surface Mount Technology Soldering Equipment Award
2020全球表面安装技术焊接设备奖

2021 Service Excellence Award
2021服务卓越奖

• Drivers for High Reliability Production
高质量生产的驱动因素

Rapidly growing markets such as Automotive Electronics, LEDs, and Power Electronics are seeking a higher demand for device performance with increasing reliability standards. Manufacturers now need to solder void-free in order to meet these reliability standards.

在迅速增长的市场中，如汽车电子、LED车灯和功率电子等领域，产品的可靠性标准得到了提高。为了实现电子制造的可靠性增强，减少或消除焊接过程中的空洞变得尤为重要，然而，这也对设备性能提出了更高的要求。

Vacuum reflow soldering remains one of the best approaches for reducing solder void rates.
真空回流焊接仍然是降低焊接空洞率的最佳方法之一。

• Factors that Affect Voids and Void Types
空洞类别和产生空洞因素

There are various types of voids which can form in SMT solder joints, such as macro voids, shrinkage voids, IMC voids and design-induced voids. Of these, macro voids (also called process voids) are most commonly seen, and can be caused by issues related to solder paste, PCB and component, or SMT processes.

在SMT焊点中可能出现各种类型的空洞，如Macro空洞、收缩空洞、IMC空洞和设计引起的空洞等。其中，Macro空洞（或工艺空洞）是最常见的，可能是由于焊膏、PCB和元件相关问题，或是SMT工艺的问题所引起的。

A

Paste
锡膏

Alloy
合金

Flux
助焊剂

B

PCB and Components
PCB和元件

PCB and finish
PCB工艺

Component material
元器件

PCB Pad design
PCB焊盘设计

C

SMT Process
SMT制程

Printing
印刷

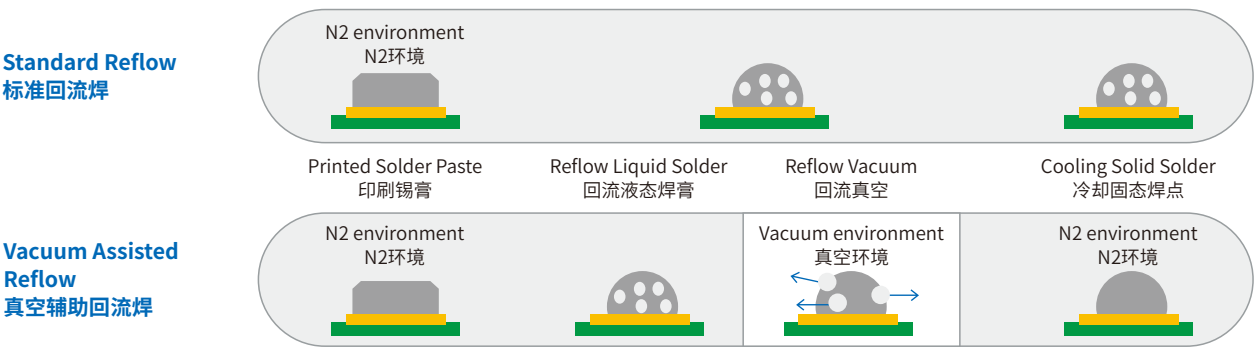
Placement
贴片

Reflow Profile
回流焊温度曲线

• Principle for Void Removal by Vacuum
真空去除空洞原理

Flux or moisture can outgas during solder reflow creating a bubble or void in a soldering joint. Vacuum assisted reflow can remove these voids by applying vacuum to a solder joint during the reflow process.

在焊接回流过程中，助焊剂或者潮湿可能会挥发出气体，导致焊接点产生气泡或空洞。通过在回流过程中对焊接点施加真空辅助，可以去除这些空洞。



Gas bubbles in liquid solder increase in size as pressure is reduced.
随着压力的降低，捕获的气泡的大小会增加。

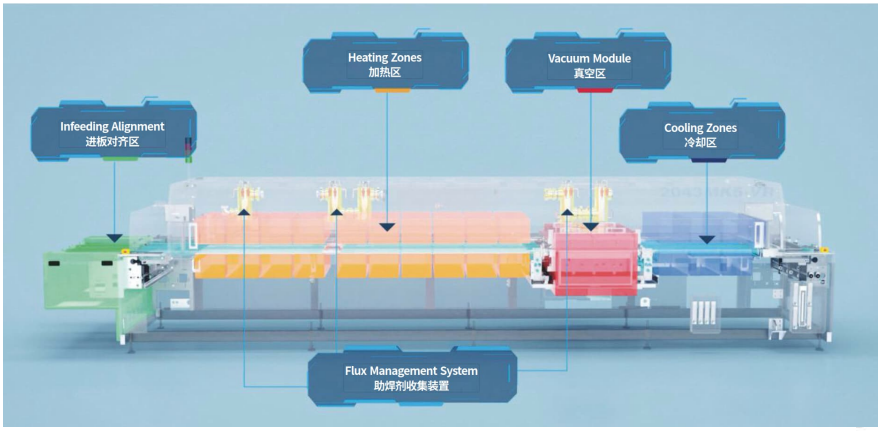
Bubbles combine with other bubbles, increasing in size until they ultimately collide with the edge of the liquid solder and escape.
气泡与其他气泡结合而变大，最终从液体焊料的边缘逃逸。

As bubbles get larger they become more buoyant, making them more likely to escape.
变大的气泡由于浮力而加速，使它们更有可能逃逸。

HELLER VACUUM REFLOW OVEN
真空回流炉

The HELLER Vacuum Reflow Oven utilizes a vacuum chamber placed in the oven's reflow zone, which provides a controlled pump down（up to 5 separate steps with closed-loop pump control）resulting in signifcant reductions to void rate (<1% for many applications）with zero solders platter. The horizontal, in-line architecture makes it suitable for automated high throughput production.

HELLER真空回流炉利用位于炉内回流区的真空室，通过可控的抽真空过程（最多可分为5个独立闭环控制的步骤）显著减少了空洞（在大多数应用中可实现<1%），且无焊料溅射。真空回流炉的水平在线式结构完全适合于自动化高产能生产。

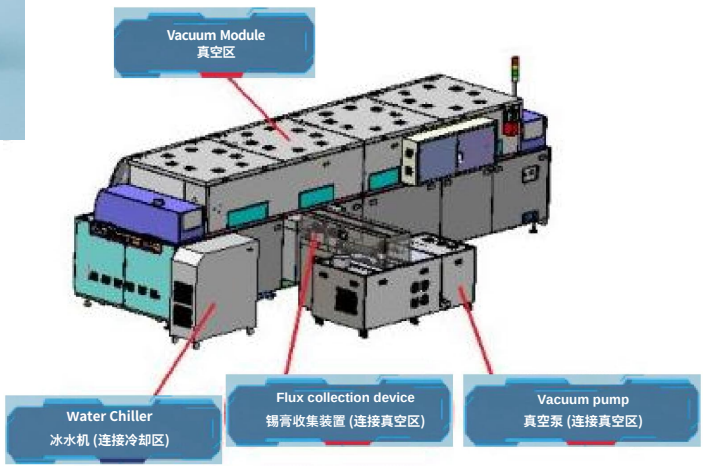


The HELLER Vacuum Reflow Oven configure the flux collection device and vacuum pump connect to the vacuum module to achieve vacuum functionality, ensuring that the vacuum pump does not malfunction due to flux contamination.

Additionally, configure the chiller to connect with the cooling zone to meet the customer's requirements for cooling slope reduction.

HELLER真空回流炉配置锡膏收集装置与真空泵连接真空区以达到真空功能, 并确保真空泵不会因助焊剂污染而故障.

并配置冰水机连接冷却区, 以达到顾客降温冷却斜率的要求。



Flexible Design
灵活的模组设计

Compatible and configurable for your specific requirement
兼容并可根据您的特定需求进行配置

Uniform Temp.Profile
均匀的温度曲线

Lower delta T's and easily adjusted thermal profile
更小的ΔT和易于调整的加热曲线

Fast Heat Transfer
快速的热补偿能力

Fast response to heat transfer for any product, delivering the highest soldering quality
对任何产品的传热快速响应，提高焊接质量

Easy PM Effort
轻松的PM工作

Less downtime for more productivity
减少停机时间，提高生产率

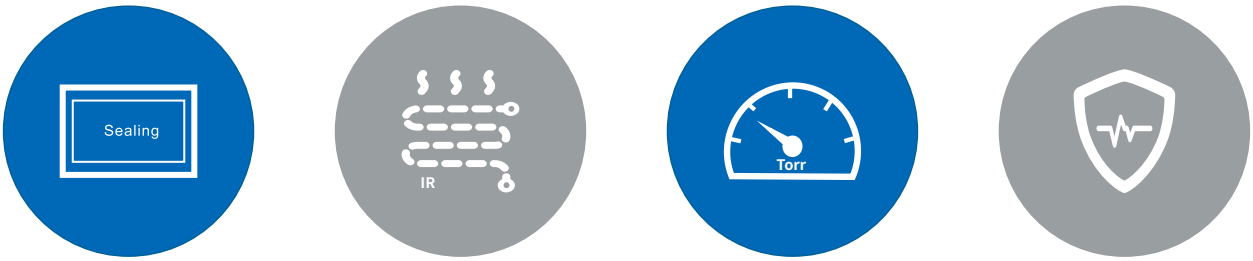
Low CoO
更低的运营成本

Reduced energy and Nitrogen consumption at any PPM level
在任何PPM水平下减少能源和氮气消耗

Smart Factory Ready
支持智慧工厂对接

Providing oven data to superior SW for smart data analysis and smart control
为上层软件提供回流焊炉数据以进行智能数据分析和智能控制

• Key Factors for Vacuum Reflowing
真空回流的关键因素



Sealing Performance
密封性能

Heating Capability in Vacuum Chamber
真空室中的加热能力

Vacuum Capability and Vacuum Control
真空能力和真空控制

Transportation Control
传输控制

HELLER vacuum ovens have the hardware capabilities to ensure the highest process quality.
HELLER真空回流炉拥有足够的硬件能力，进而确保工艺质量。

01 Sealing Performance
密封性能

• High Sealing Performance of HELLER Vacuum Chamber
HELLER真空室的高密封性能

A

High Sealing Performance
高密封性能

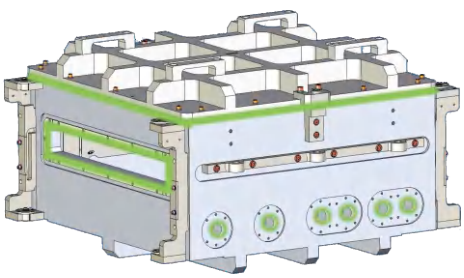
Advanced mechanical designs with materials suitable for high temps ensures the best sealing performance when vacuum is activated.
先进的机械设计和高温密封材料，确保真空工况下的最佳密封性能。

B

Single-Piece Machined Aluminum Chamber
一体成型和机加工

CNC machined one-piece vacuum chamber with gas cooling system, ensures sealing performance and structure integrity.
精确的成型和加工工艺确保密封性能和长寿命。

Design of vacuum chamber
真空室设计



Vacuum assisted reflow uses a vacuum chamber in the reflow process to remove voids from melted solder paste. The result is a solder joint that is void-free.
真空辅助回流焊在回流过程中使用真空室去除熔融焊膏中的空洞，其结果是形成了一个没有空洞的焊点。

02 Heating Capability In Vacuum Chamber
真空室中的加热能力

• Shorter Time Above Liquidus with IR Chamber Heating
真空室红外加热缩短液相线上的时间

A

Heating Capability in Chamber
真空室加热能力

- IR heated vacuum chamber up to 450°C, allows for peak temperature to occur inside the chamber for shorter time above liquidus.
- Maintains or increases product temperature during the vacuum phase.
- Balanced temperature across products of all sizes.

真空腔加热可达450°C，峰值温度腔内发生，缩短液相以上加热时间。
可实现在真空阶段保持或提高产品温度；
可达成不同产品尺寸下的板上温度均衡。

B

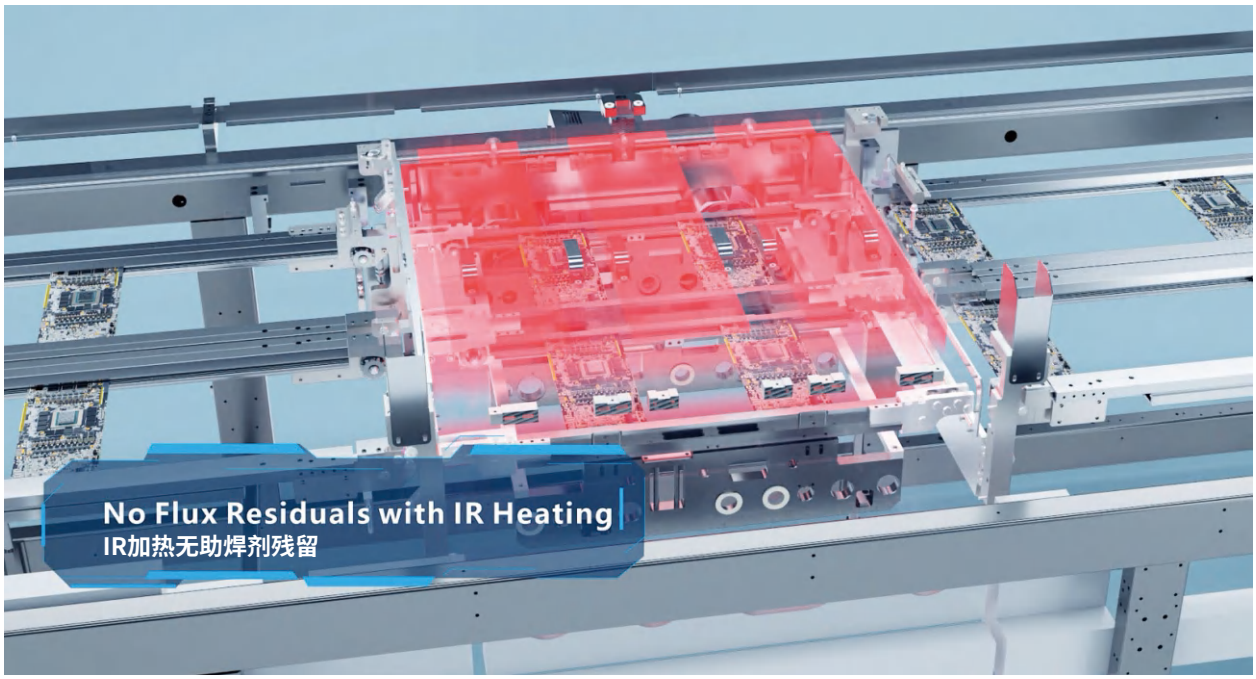
Easy Maintenance
易于维护

- Active heating inside the Vacuum Chamber prevents flux residue buildup on sidewalls and the EHC & CBS mechanisms.
- Eliminates Conveyor Cleaning, reducing PM effort.

真空室内的主动加热可防止助焊剂残留物沉淀到EHC和CBS轨道上；
无需清洁轨道，减少保养工作量。

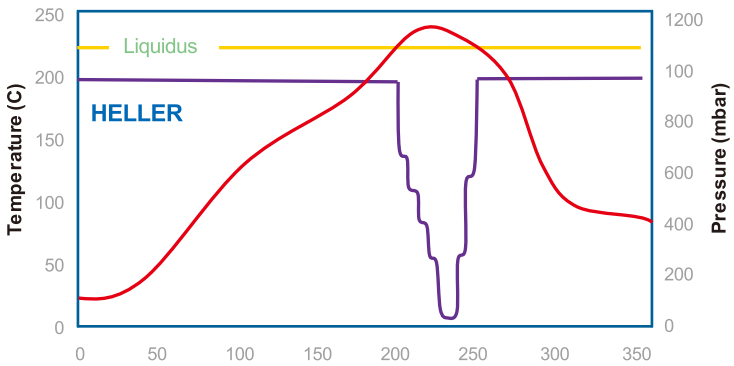
HELLER vacuum IR heaters enable temps as high as 450°C, and allow peak inside vacuum chamber.
HELLER真空红外加热器可提供高达450°C的温度，可在真空室中达到峰值温度。

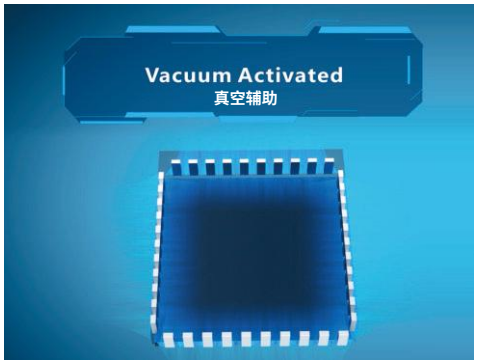
3-zone IR panel inside vacuum chamber
真空室内的3区红外面板



03 Vacuum Capability and Vacuum Control
真空能力和真空控制

• Closed Loop Pressure Control Prevents Splatter and Solder Balls
闭环真空控制可防止焊膏飞溅和锡珠





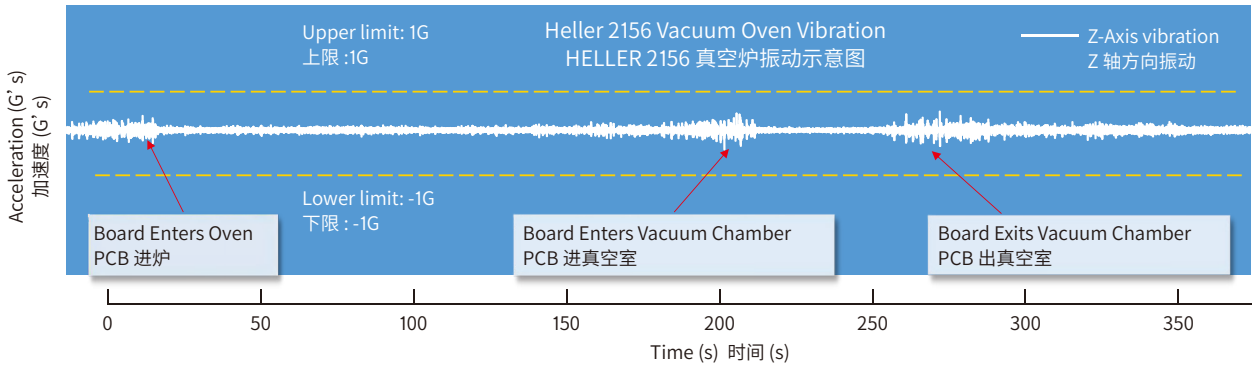
HELLER Temperature and Vacuum Control
HELLER温度和真空控制

IR heaters in vacuum chamber heats up to 450°C.
Temperature peak can occur inside chamber for shorter time above liquidus and faster throughput.
Closed-loop pump control allows for a controlled vacuum process preventing solder splash and solder ball defects.
真空室中的红外加热器加热温度高达450°C;
温度峰值可在真空室内实现;液相线上的时间较短;
更高的产能;真空多步控制,工艺稳定;无飞溅和锡珠缺陷。

04 Transportation Control
传输控制

HELLER offers an ultra smooth transportation system to ensure extremely low board vibrations during transport minimizing the risk of defects related to shifting parts.

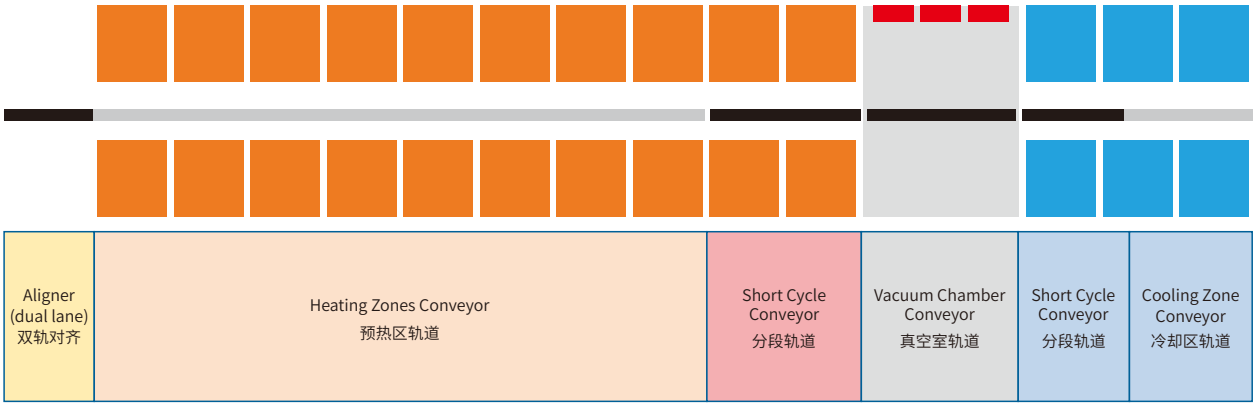
HELLER提供一个超平稳的运输系统,以确保运输过程中较低的PCB振动,最大限度地减少元件与偏移相关的缺陷。



• Short Cycle Conveyor System for High UPH
Short Cycle传输系统–提高UPH

HELLER's new high-UPH Short Cycle conveyor system dramatically increases throughput by utilizing 5 independently controlled conveyor systems. The oven's staging conveyors move boards quickly into and out of the vacuum chamber, reducing cycle times buy up to 50%. For typically use cases, throughput improvements of 100% or more can be seen. Additionally, the system has a separate cooling conveyor which can be slowed down to increase cooling time leading to much lower board exit temperatures.

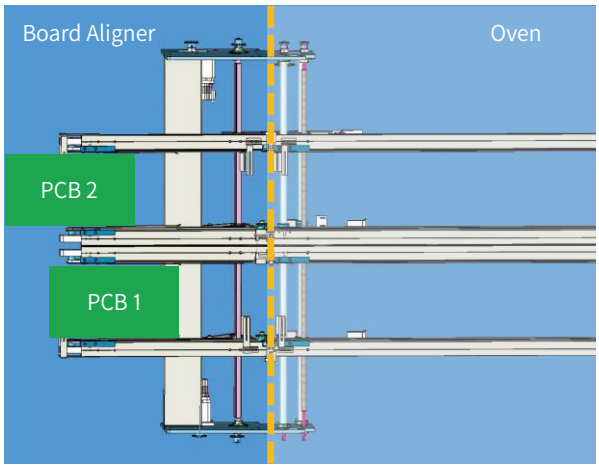
HELLER的新型高UPH的Short Cycle输送系统利用5个独立控制的输送系统，显著提高了产能。回流炉的分段传送带可快速将PCB板进出真空室，减少循环时间多达50%。对于典型的使用案例，产能可以提高100%或更多。此外，该系统还配备了独立的冷却传送带，可以减缓速度以增加冷却时间，实现更低的出板温度。

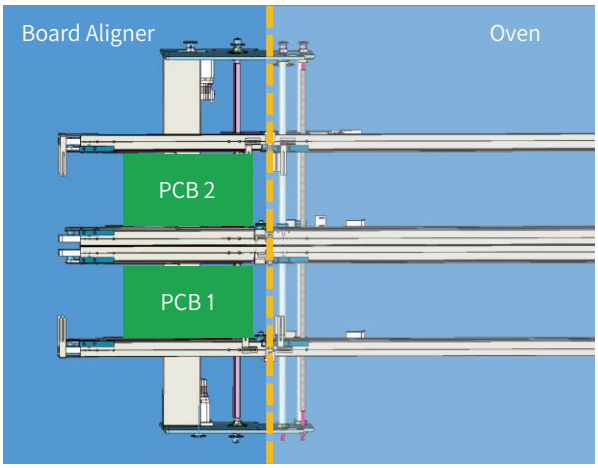


• Board Aligner for High Utilization
高利用率的电路板对齐机构

Productivity can be further improved by using a dual lane vacuum system with HELLER's dual lane board aligner. The board aligner accepts and holds upstream boards until both boards are aligned before allowing them to enter the oven at the same time, optimizing utilization of the vacuum chamber. Say goodbye to productivity setbacks caused by misalignment, and experience seamless board movement every step of the way.

通过使用HELLER的双轨道真空系统和双轨道PCB对齐机构，可以进一步提高生产效率。PCB对齐机构接收并保留上游PCB，直到两块PCB对齐后才允许它们同时进入回流炉，优化真空室的利用。告别因错位而导致的生产效率下降，体验无缝的PCB传输。

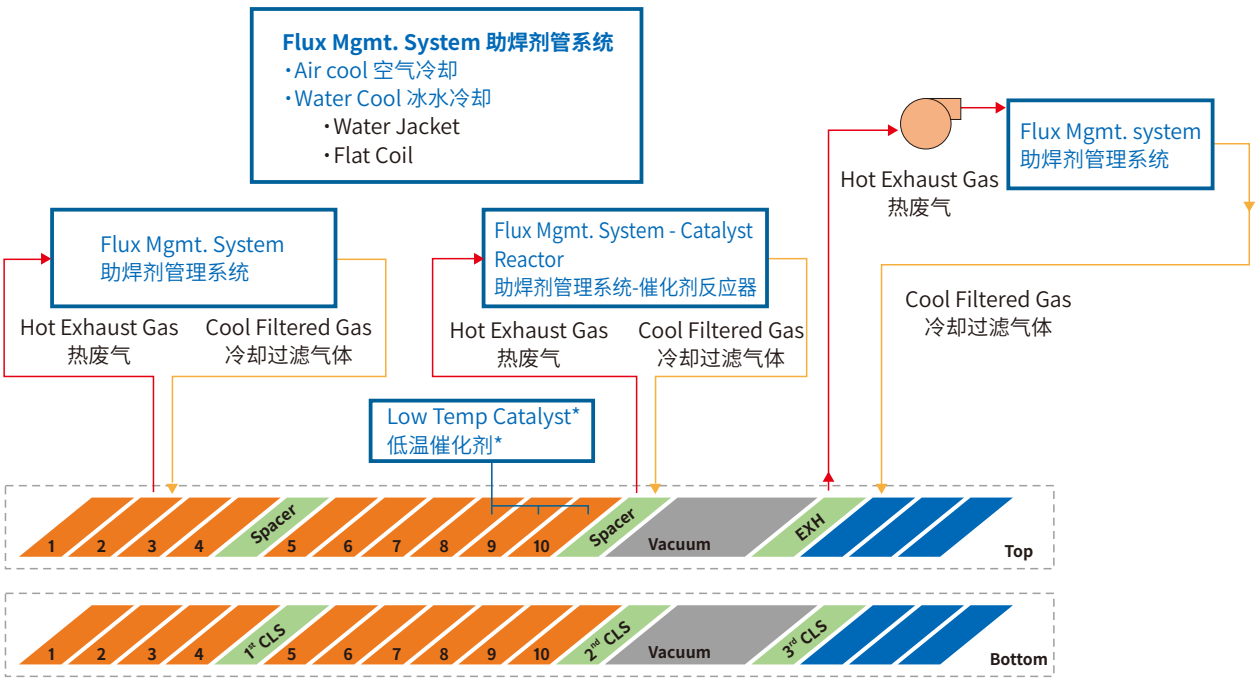




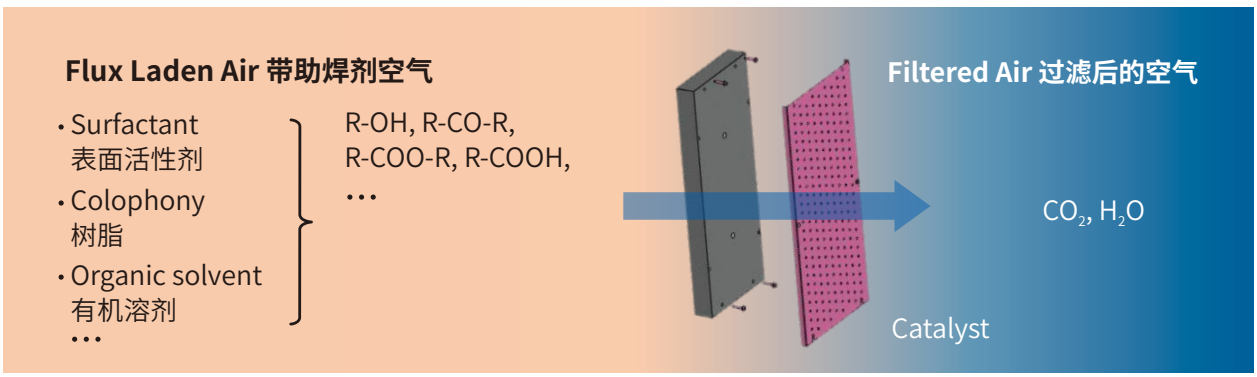
• Flux Management System
助焊剂管理系统

HELLER offers various solder flux management systems depending to the required flux load. These systems include basic optionsfor air cooled and water cooled systems, as well as advanced flux management systems such as the low-temperature catalyst and a flux reactor system. All systems provide exceptional flux removal capability, extending maintenace intervals and shortening required maintenance times.

根据助焊剂使用量，HELLER提供各种不同的助焊剂管理系统。这些系统包括基本的风冷和水冷系统选项，以及高阶助焊剂管理系统，例如低温催化剂和助焊剂反应器系统。所有这些系统都提供出色的去除能力，延长了维护间隔，并缩短了所需的维护时间。



2043MK7 Machine Layout
⋆ option



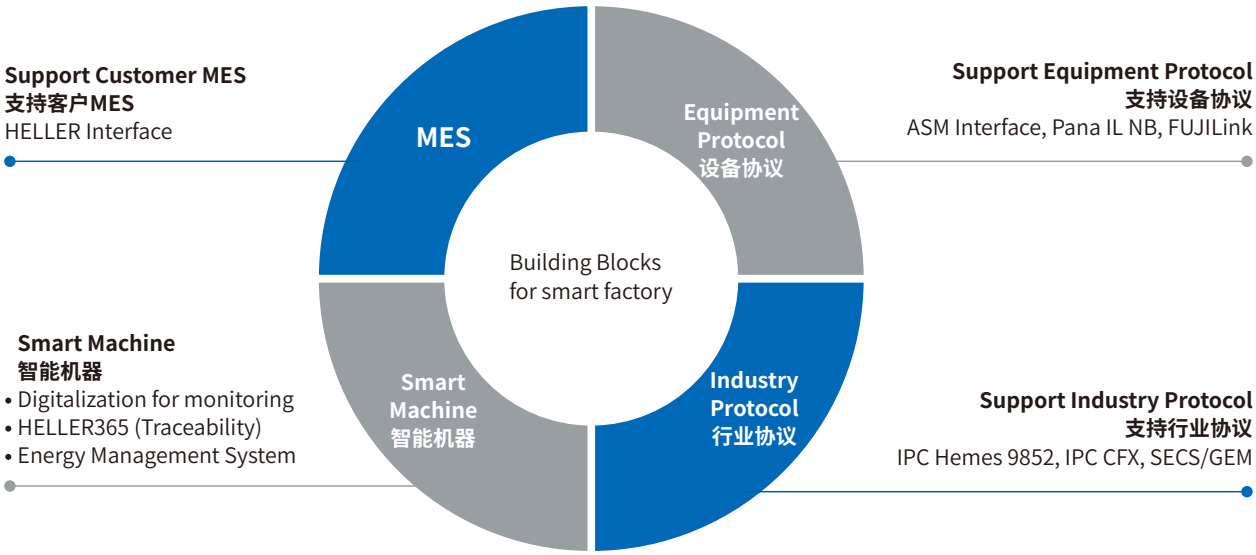
HELLER has developed the new “Low Temperature Catalyst” flux management solution. The catalyst breaks down and removes flux volatiles through a chemical reaction turning them into harmless byproducts (CO2 and water).
HELLER已经开发出全新的“低温催化剂”助焊剂管理解决方案。该催化剂通过化学反应将助焊剂挥发性物质反应并去除，将其转化为无害的副产物（二氧化碳和水分子）。

The catalyst helps keep the oven chamber clean from flux residue and prolongs the period required for flux-related maintenance.
催化剂有助于保持回流焊炉室内干净，减少助焊剂残留物，并延长与助焊剂相关的维护周期。

• Smart System for Smart Manufacturing
智能系统赋能智能制造

Digitalization is changing all areas of our lives, and manufacturing is no different. Manufacturing companies must move with this trend by adopting smart manufacturing processes in order to stay competitive. While the ultimate goals of fast delivery, low cost and high quality have remained unchanged, the management and analysis of data from production, process and equipment is now essential. HELLER understands this, and our software tools fully support smart manufacturing and Industry 4.0.

数字化正在改变我们生活的各个领域，制造业也不例外。制造公司必须跟上这一趋势，采用智能制造过程，以保持竞争力。尽管快速交货、低成本和高质量的终极目标仍然不变，但现在对生产、工艺和设备数据的管理和分析变得至关重要。HELLER充分理解这一点，我们的软件工具完美支持智能制造和工业4.0。



HELLER ovens are smarter than ever before with integrated hardware and software. This enables operators to monitor their process in real-time and quickly make changes to improve product quality and yield, while reducing costs. HELLER 365 provides live oven monitoring of thermal processes at the board level to ensure they are under control and within specifications. All data is saved, allowing users to review previous production and process data.

HELLER回流炉采用集成的硬件和软件，比以往任何时候都更智能化。这使操作人员能够实时监控生产过程，并快速进行改进，以提高产品质量和产量，同时降低成本。HELLER365提供了对电路板级热处理过程的实时回流监测，确保其处于控制之下并符合规格要求。所有数据都被保存下来，用户可以追溯以前的生产和工艺数据。

HELLER365 (Traceability) 可追溯性

HELLER365

Virtual Profile - Board Level Monitoring
虚拟炉温曲线 - 板级监控

HELLER ovens also support 3rd party solutions such as KIC RPI.
HELLER回流焊炉还支持第三方解决方案，如KIC RPI。

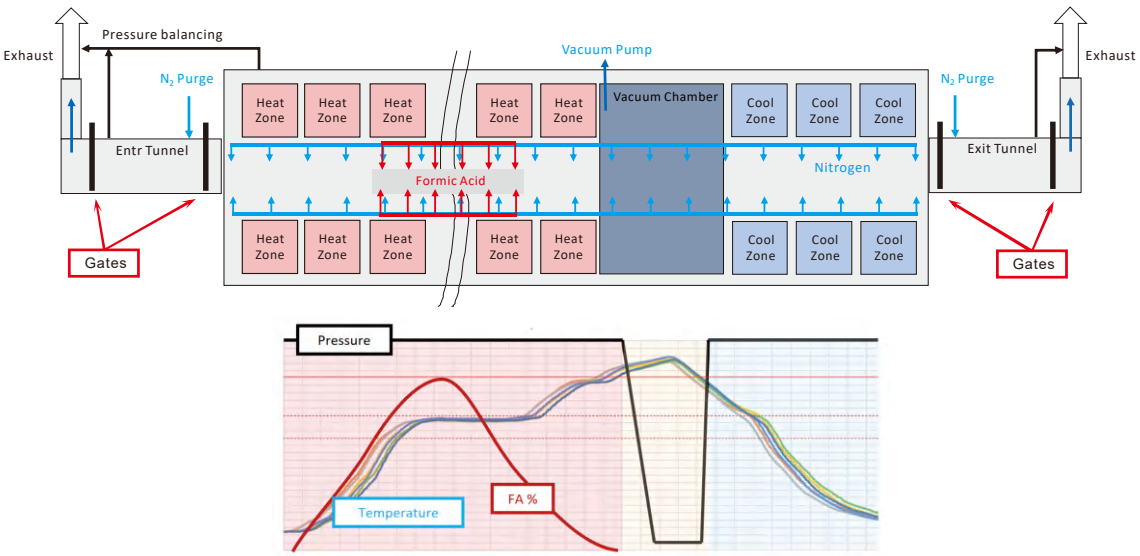
• Vacuum + Formic Acid Solution for Flux-Free Process
真空+甲酸溶液用于无焊剂工艺

HELLER proudly presents VFAR, a horizontal fluxless formic reflow oven with vacuum capability. This state-of-the-art oven combines all of the benefits of vacuum reflow and fluxless reflow for the lowest void rates and highest product quality. The oven aheres to all SEMI S2/S8 safety standards, including those governing hazardous gases.

HELLER自豪地推出了VFAR，一款具有真空功能的水平无助焊剂甲酸回流炉。这款最先进的回流炉结合了真空回流和无助焊剂回流的所有好处，以实现较低的空洞率和较高的产品质量。该回流炉符合所有Semi S2/S8安全标准，包括涉及危险气体的标准。

Our formic acid process efficiently eliminates any oxides on the metal surface prior to reflow, thereby eliminating the need for any fluxing agents. All defects, incluing voids, related to flux residues are eliminated. Remove flux deposition and cleaning steps from your process and save floor space and operating costs.

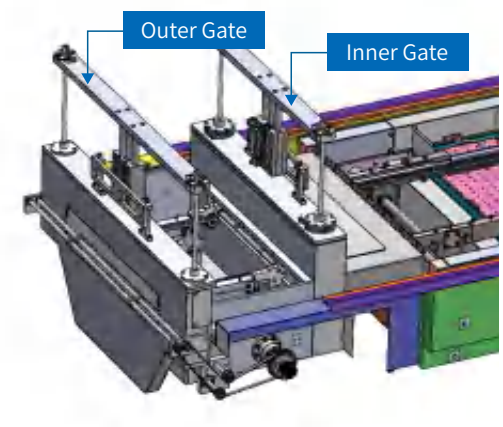
我们的甲酸工艺能够在回流之前有效地消除金属表面上的氧化物，从而消除了使用助焊剂的需要。所有与助焊剂残留物相关的缺陷，包括空洞，都被消除了。从您的工艺中去除助焊剂残留和清洁步骤，节省了工厂空间和运营成本。



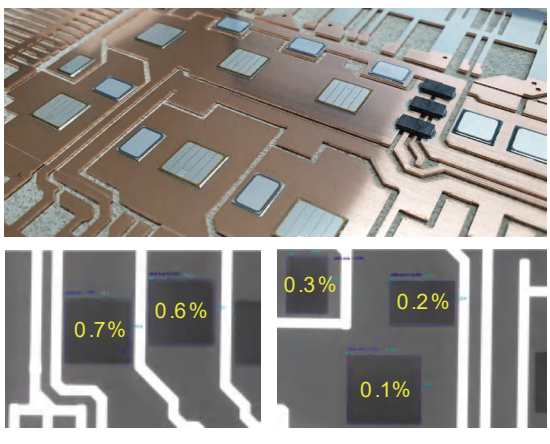
Profile of Vacuum Formic Acid Reflow 真空甲酸回流曲线

HELLER's new patented formic gate system serves to dramatically reduce process gas consumption by up to 45%. The formic gate system acts as sets of double doors placed at the oven' s entrance and exit. During production, only one door opens at a time when a product is entering or exiting the machine. This isolates the process chamber from the outside and lowers nitrogen and formic acid consumption.

HELLER的新型专利Formic Gate系统能够将工艺气体消耗率显著降低高达45%。Formic Gate系统是在回流炉的入口和出口处设置的双重门组成的。在生产过程中，只有一个门会在产品进入或离开机器时打开。这样可以将工艺腔室与外界隔离，降低氮气和甲酸的消耗。



Formic Gate System
Formic Gate系统



Void rate results for IGBT and Solder Preform on VFAR
VFAR上IGBT和预制焊片的空洞率结果

• HELLER Product and Application Matrix
HELLER产品和应用矩阵

市场细分	制程应用	Reflow Oven	Curing Oven	Vacuum Reflow Oven	FAR	VFAR	Vacuum Forming Gas Reflow Oven	VCO	PCO	PRO	VEFO	Snap Curing Oven	Batch Curing Oven	HMO	HCO
SMT&电子组装	Solder Reflow	O													
	Low Void Solder Reflow			O											
	Epoxy Curing		O					O				O	O		
	Low Void Epoxy Curing								O						
功率器件	IGBT Assembly				O	O	O								
	Low Void Soldering			O											
半导体封装	Ball Attach	O													
	Bumping	O			O	O									
	Flip Chip Reflow	O													
	Flip Chip Fluxless reflow				O	O									
	Flip Chip Epoxy Cure		O					O	O		O				
	LED Low Void Solder			O											
	Semi Curing (DAF, underfill, etc)		O					O						O	
	Curing (Panel, Copper Plate)								O						O
	Low Void Curing								O		O				
	TIM Attach				O					O					

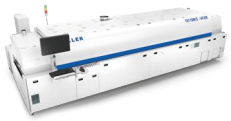
01 Reflow Oven

02 Curing Oven

03 Vacuum Reflow Oven

04 Formic Acid Reflow Oven (FAR)

05 Vacuum Formic Acid Reflow Oven (VFAR)



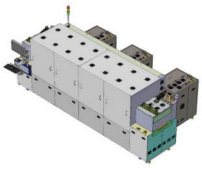
06 Vacuum Forming Gas Reflow Oven

07 Vertical Curing Oven (VCO)

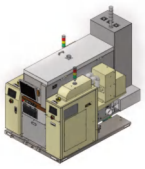
08 Pressure Curing Oven (PCO)

09 Pressure Reflow Oven (PRO)

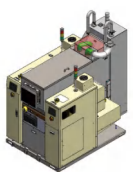
10 Vacuum Epoxy Flowout Oven (VEFO)



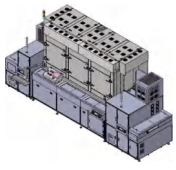
11 Snap Curing Oven



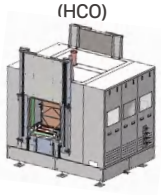
12 Batch Curing Oven



13 Heller Magazine Oven (HMO)



14 Heller Curing Oven (HCO)



• Vacuum Oven Spec
真空回流炉规格参数

	1808MK5-VR	1911MK5-VR	1912MK5-VR	1936MK5-VR	2043MK5-VR	2156MK5-VR
基本数据						
长度（mm）	4,660	5,900	5,900	5,900	6,780	8,700
宽度（mm）***	1,720	1,720	1,720	1,720	1,720	1,930
高度（mm）	1,635	1,635	1,635	1,635	1,635	1,635
重量（kg）*****	3,360	3,760	3,670	3,620	3,850	5,700
电源和氮气						
电源输入	208/240/380/400/415/440/480 VAC (50Hz/60Hz)					
最大电流	130Amp @ 208V ~ 240V**** 100Amp @ 380V ~ 480V****				200Amp @ 208V ~ 240V**** 130Amp @ 380V ~ 480V****	
持续功率（kW）	7-14	10-16	10-16	9-15	13-20	15-28
氮气供应压力（bar）	5-7					
氮气工作压力（bar）	6					
典型氮气消耗**	500-700SCFH					
真空泵	**(请参考具体真空泵和真空炉布局)**					
长度 x 宽度 x 高度（mm）	1,750 x 770 x 690					
重量（kg）	330					
电源输入	208V ~ 480V (50Hz/60Hz)***					
最大电流（Amp）	20					
持续功率（kW）	4-7					
真空泵标称速度（m3/hr）	280(50Hz) / 340(60Hz)					
真空压力/速度控制	5步真空控制 / 速度控制					
加热和冷却						
加热区*	7	10	11	8	10	15
加热长度（mm）*	1,930	2,875	3,040	2,865	3,590	5,170
冷却区*	2	3	3	3	3	4
冷却长度（mm）*	830	1,115	1,095	1,285	1,270	1,520
最高温度（°C）	350/450					
温度控制解析度（°C）	+/-0.1					
换线时间（min）	5-15					
真空腔						
标准真空腔尺寸（L x W，mm）	500x450	500x450	350x450	350x450	500x450	600x600
选项真空腔尺寸（L x W，mm）*	/				600x600	500x450
真空腔加热	3-Zone IR					
真空腔加热功率（kW）	9.5	9.5	7	7	9.5	13.5
真空腔最高设置温度（°C）*	400, option 480					
最低真空腔压力	10 Torr(13.3mbar)，Option 5 Torr(6.65mbar)					
PCB 支持						
单轨道/ 网带（mm）*	100-450	100-450	100-450	100-450	100-450	100-600
双轨道单轨模式（mm）*	100-240	100-240	100-240	100-240	100-240	100-400
双轨道双轨模式（mm）*	100-170	100-170	100-170	100-170	100-170	100-250
最小PCB长度（mm）*	150, option 120					
双轨导轨*	FMMF, FMFM					
PCB 方向	LtoR, RtoL					
PCB 顶部 / 底部间隙（mm）*	Meshbelt: Top 58, Option Top 38　Chain: ±29, Option ±35　Chain with CBS: +29/-10					
传板高度（mm）*	Meshbelt: 930+/-60　Chain: 960+/-60, Option 900+/-60					
传板速度（mm/min）*	250-1,880					
PCB 支撑pin长度（mm）*	4.75					
自动润滑系统	S					
电源宽度调整	S					
KIC 调校软件	S					
其他选项	具有Side Chain（MB 或 Rod）的高温炉选项或 高产能Rapid Cycle传输系统选项					

*特殊选项可根据要求提供

**取决于 PPM、PCB 尺寸和具体配置而变化

***根据真空腔尺寸而变化，不包括真空泵

****电压：208V/240V/380V/400V/415V/440V/480V

*****回流炉重量因实际配置而变化

S：标准

请注意，空气炉和氮气炉的规格可能会有所不同，并且由于产品改进或技术更新，实际产品的规格可能与此促销手册中列出的规格不同。
有关最新信息，请与我们联系。

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