



HELLER VACUUM REFLOW OVEN

真空回流炉

LOW VOID SOLDERING AT HIGH THROUGHPUT
满足低空洞率焊接与高产能需求

HELLER
INDUSTRIES

The Thermal Technology Leader
in Semicon and SMT

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

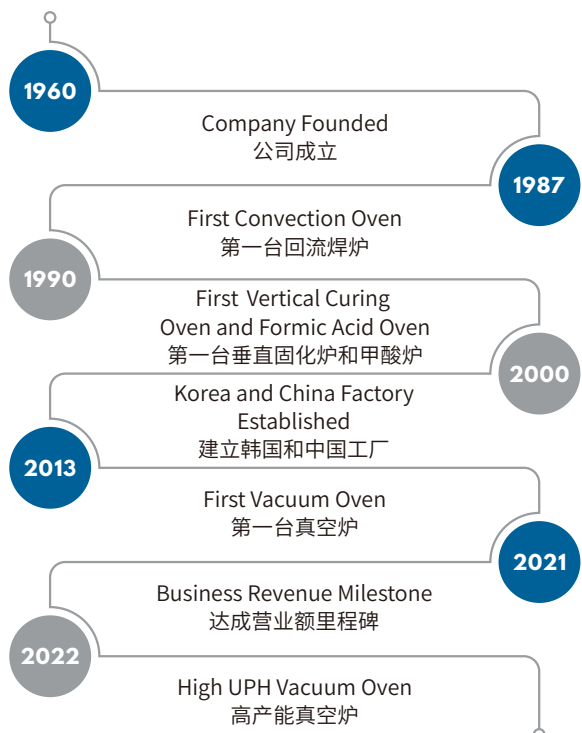
MARKET LEADER - HELLER Industries was founded in 1960, pioneered convection reflow soldering in the 1980s, and has been at the forefront of innovation ever since. HELLER partners with customers to continually refine systems to meet today's advanced applications requirements. By embracing challenge and 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年代开创了对流回流焊接。多年来,HELLER与客户合作,不断完善系统以满足应用制程要求。通过迎接挑战和变化,HELLER赢得了热处理解决方案行业领先者的地位。

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,为客户提供未来的应用和挑战。

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

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

Partner with Leading Companies to Drive New Manufacturing Technology, Helps 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

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。



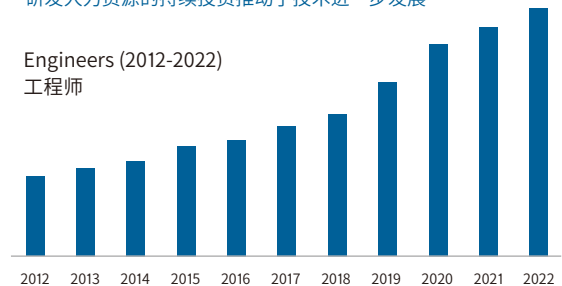
Green Technology 绿色科技

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

Engineers (2012-2022)
工程师



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 seeing 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。

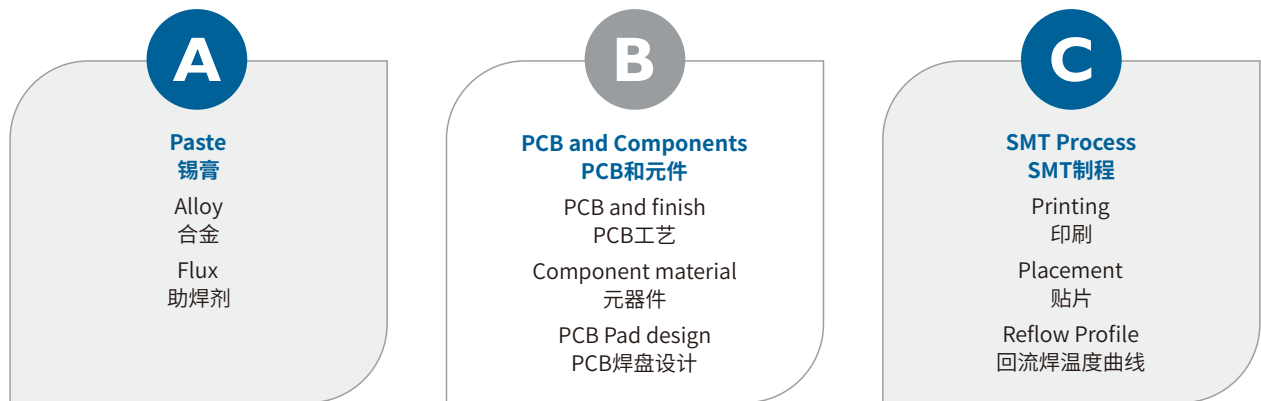


Vacuum reflow soldering remains one of the best approaches for reducing solder void rates.
真空回流焊接仍然是降低焊接空洞率的优选方法之一。

• 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.

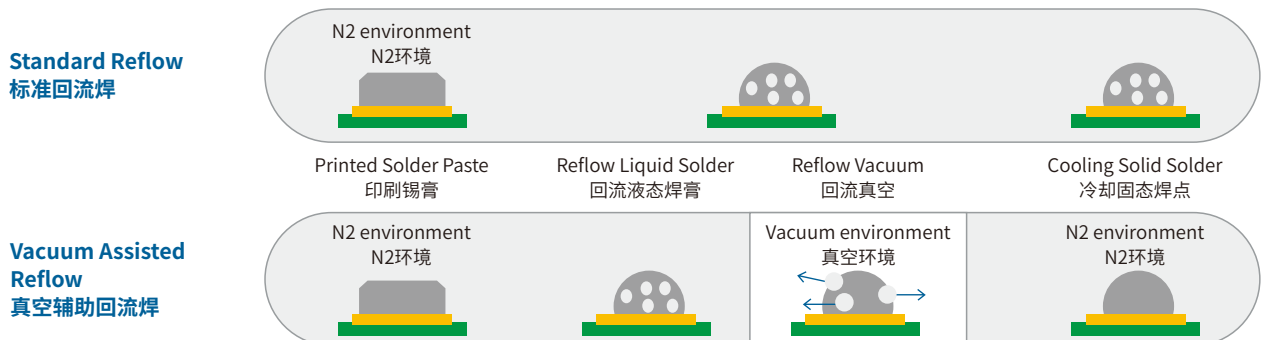
在SMT焊点中可能出现各种类型的空洞,如Macro空洞、收缩空洞、IMC空洞和设计引起的空洞等。其中,Macro空洞(或工艺空洞)是最常见的,可能是由于焊膏、PCB和元件相关问题,或是SMT工艺的问题所引起的。



• 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。

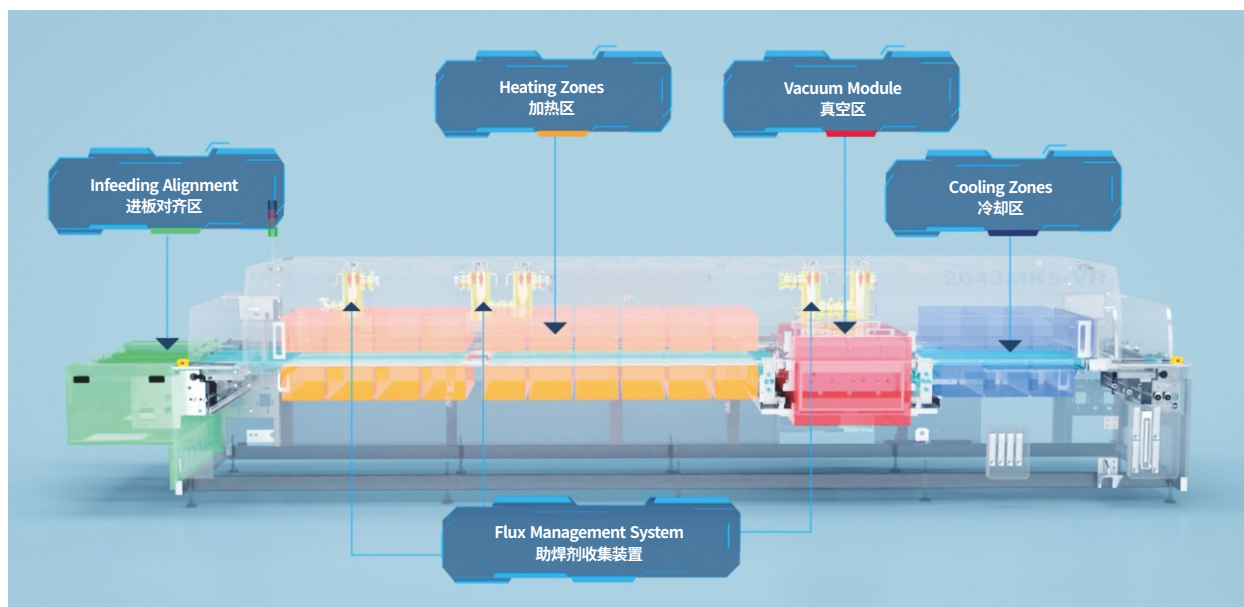
As bubbles get larger they become more buoyant, making them more likely to escape.
变大的气泡由于浮力而加速,使它们更有可能逃逸。

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 significant 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<1%），且无焊料溅射。其水平在线式结构完全适合于自动化高产能生产。



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

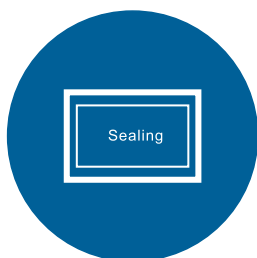
Reduced energy and Nitrogen consumption at any PPM level
在任何PPM水平下减少能源和氮气消耗



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 Reflow 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, 确保真空工况下的良好密封性能。

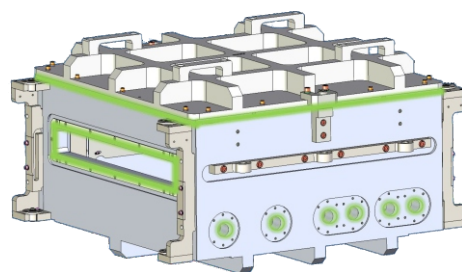
B

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.
- 将真空室加热至450°C, 在真空室内的峰值时间较短;
在真空阶段保持或提高产品温度;
各种尺寸产品的温度平衡。

B

Easy Maintenance

易于维护

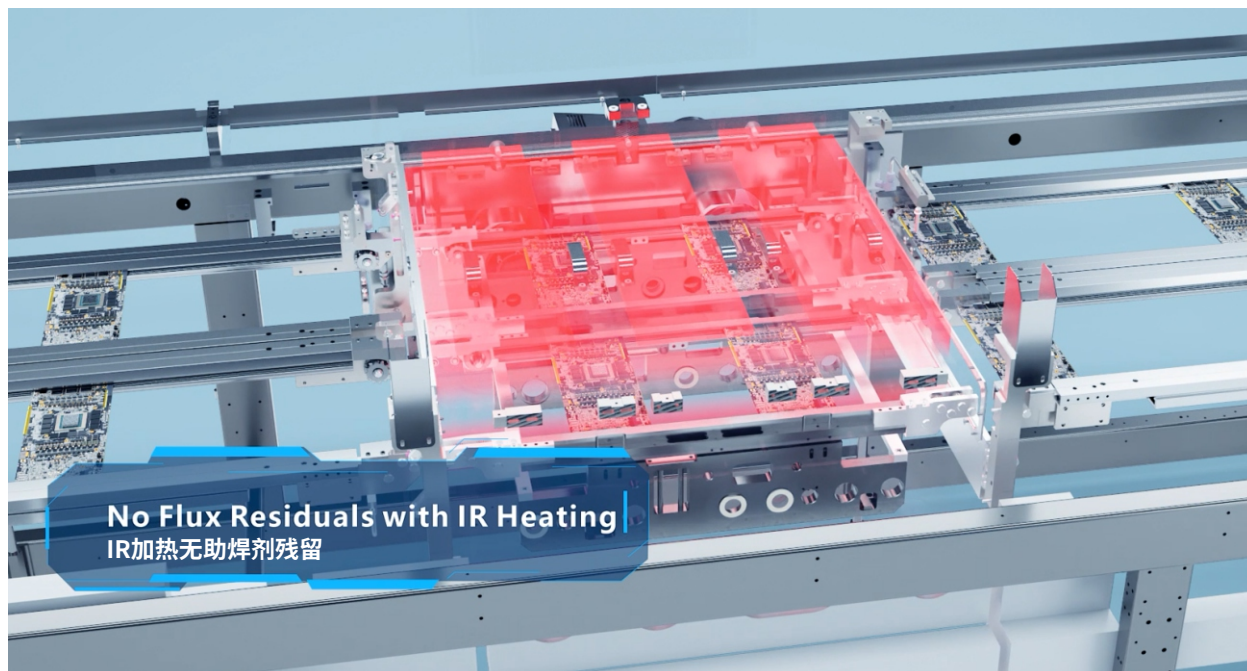
- Active heating inside the Vacuum Chamber prevents flux residue buildup on sidewalls and the EHC & CBS mechanisms.
 - Eliminates Conveyor Cleaning, reducing PM effort.
- 真空室内的主动加热可防止助焊剂残留物沉淀到EHC和CBS轨道上;
无需清洁轨道, 减少保养工作量。

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



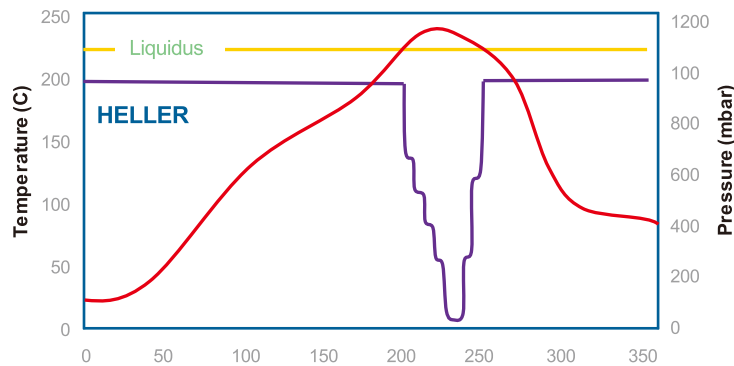
No Flux Residuals with IR Heating
IR加热无助焊剂残留

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。



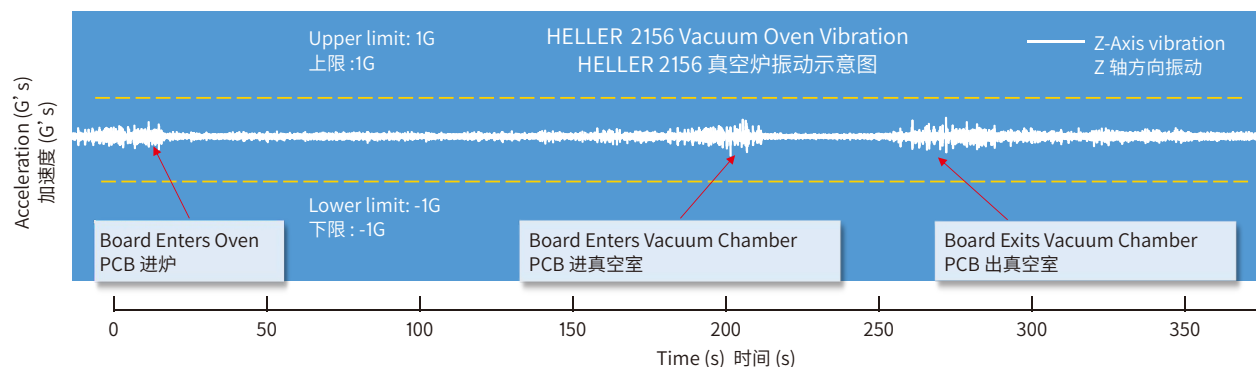
04

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.

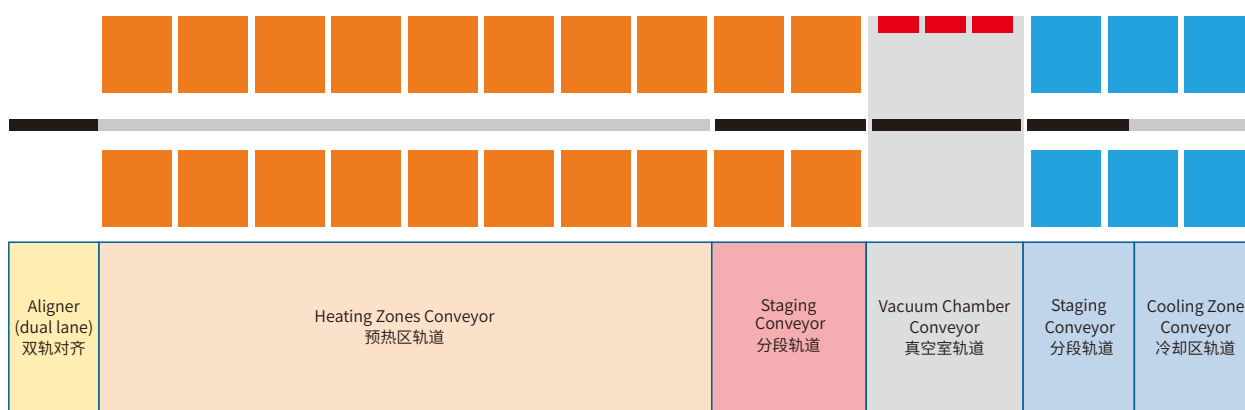
HELLER提供一个超平稳的运输系统，以确保运输过程中较低的PCB振动，较大幅度地减少元件与偏移相关的缺陷。



• Multi-Stage Conveyor System for High UPH 多段式传输系统 – 提高UPH

HELLER's new high-UPH multi-stage 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 by up to 50%. For typically use cases, throughput improvements of 85% 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.

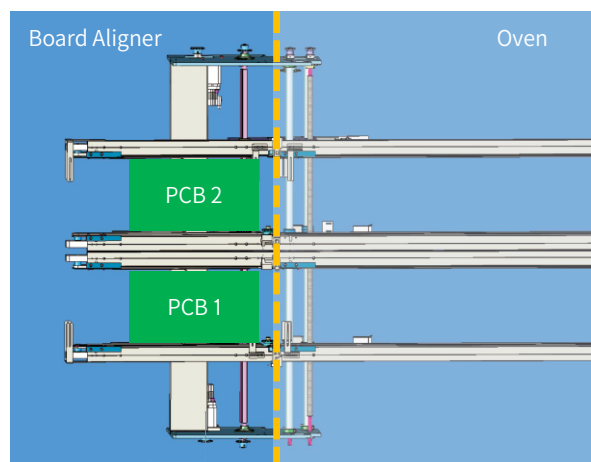
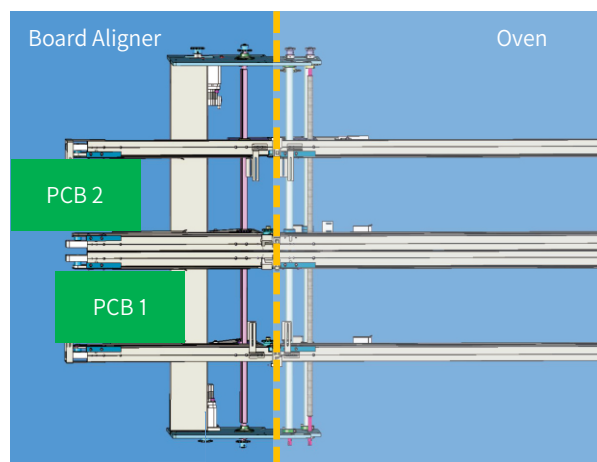
HELLER的新型高UPH多段输送系统利用5个独立控制的输送系统,显著提高了产能。回流炉的分段传送带可快速将PCB板进出真空室,减少循环时间多达50%。对于典型的使用案例,产能可以提高85%或更多。此外,该系统还配备了独立的冷却传送带,可以减缓速度以增加冷却时间,实现更低的出板温度。



• 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。

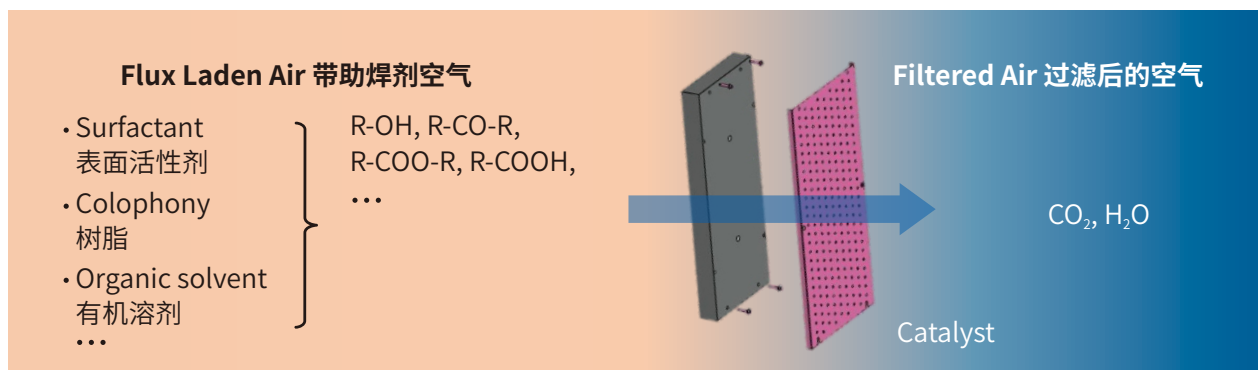
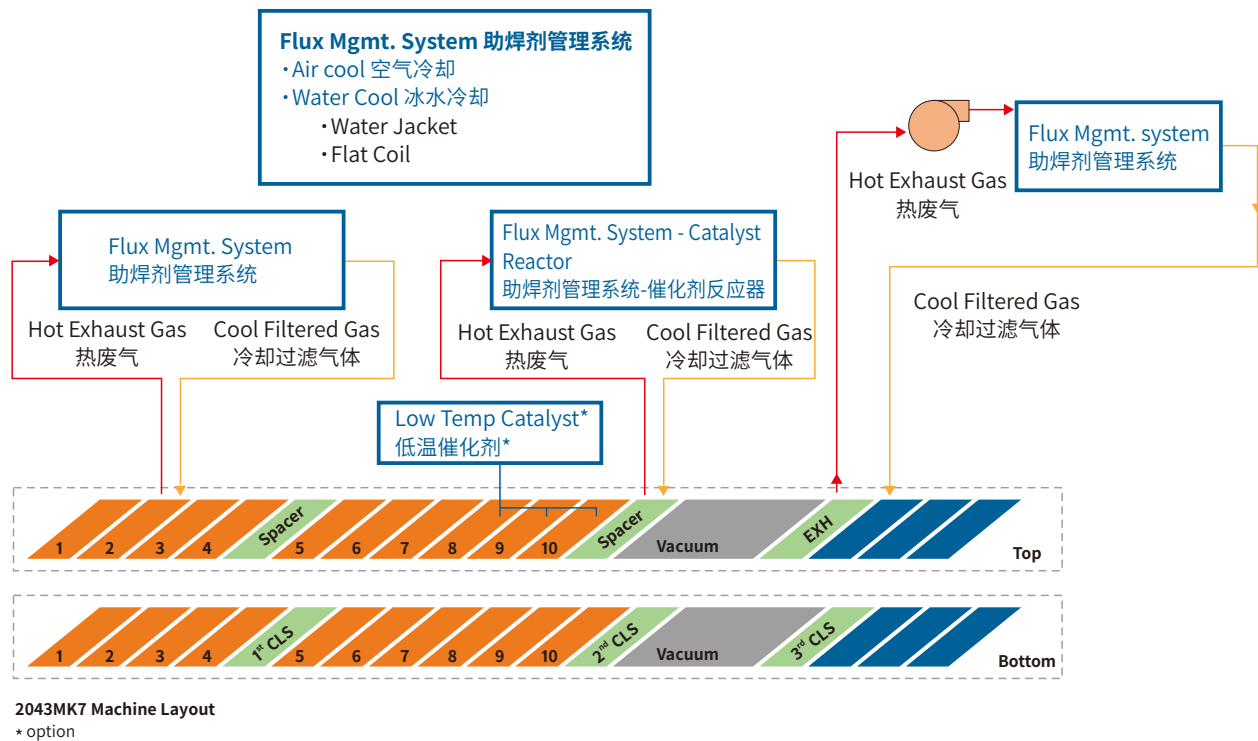


Additional Features

• 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 options for 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 maintenance 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。



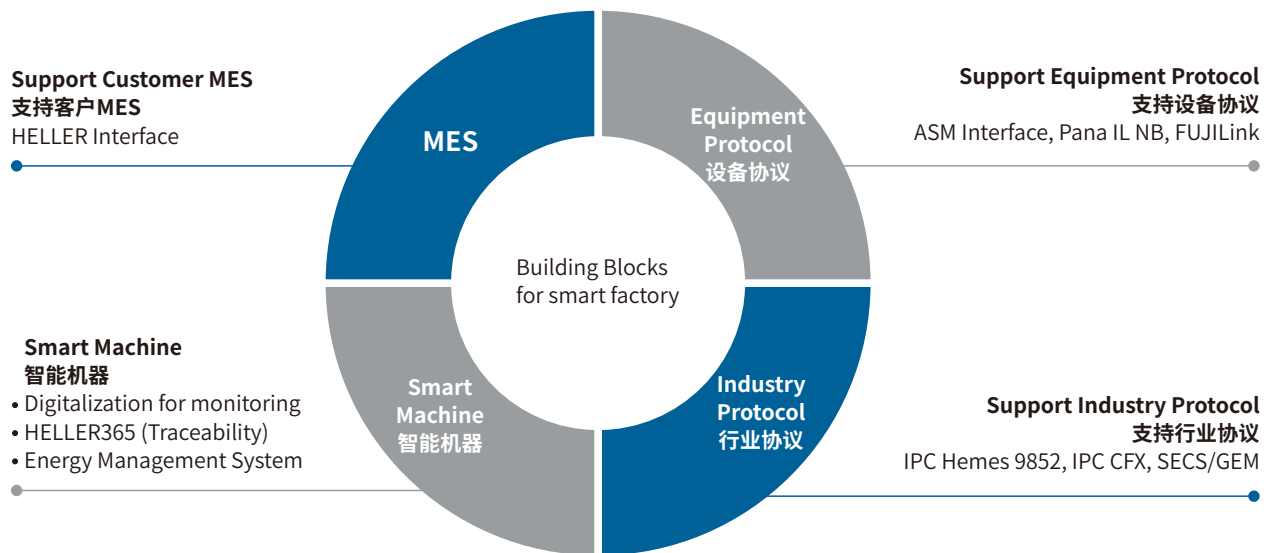
HELLER has developed the new “Low Temperature Catalyst” flux management solution. The catalyst breaks down and removes flux volatiles through a chemical reaction turning them into harmless byproducts (CO₂ and water). HELLER已经开发出全新的“低温催化剂”助焊剂管理解决方案。该催化剂通过化学反应将助焊剂挥发性物质反应并去除，将其转化为无害的副产物（二氧化碳和水分子）。

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。

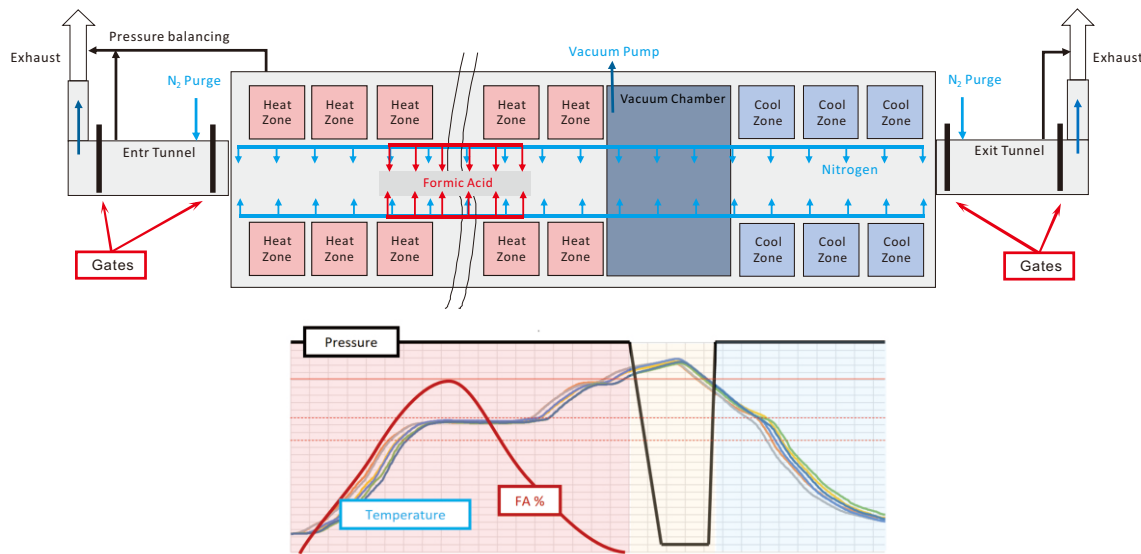
• Vacuum + Formic Acid Solution for Flux-Free Process 真空+甲酸溶液用于无焊剂工艺

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 adheres 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焊剂甲酸回流炉。这款回流炉结合了真空回流和无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, including voids, related to flux residues are eliminated. Remove flux deposition and cleaning steps from your process and save floor space and operating costs.

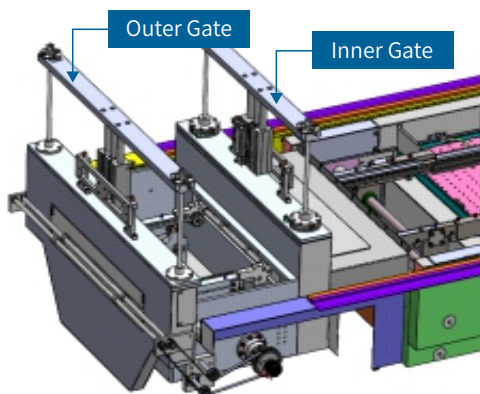
我们的甲酸工艺能够在回流之前有效地消除金属表面上的氧化物，从而消除了使用助焊剂的需要。所有与助焊剂残留物相关的缺陷，包括空洞，都被消除了。从您的工艺中去除助焊剂残留和清洁步骤，节省了工厂空间和运营成本。



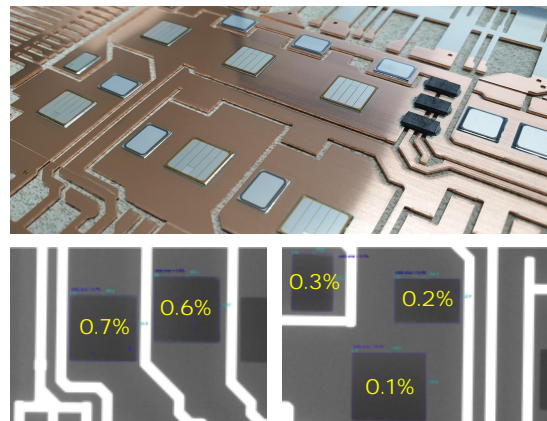
Profile of Vacuum Formic Acid Reflow 真空甲酸回流曲线

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

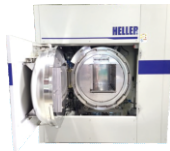
Market Segment	Applications	Horizontal Reflow	Horizontal Cure	Horizontal Vacuum Reflow	Horizontal Formic	Formic+ Vacuum	Forming Gas+ Vacuum	VCO	PCO	PRO	VEFO	Snap Cure	Batch Cure	HMO	HCO
SMT & Electronics Assembly	Solder Reflow	X													
	Low Void Solder Reflow			X											
	Epoxy Curing		X					X				X	X		
	Low Void Epoxy Curing								X						
Power Electronics	IGBT Assembly				X	X	X								
	Low Void Soldering			X											
Semiconductor Packaging	Ball Attach	X													
	Bumping	X			X	X									
	Flip Chip Reflow	X													
	Flip Chip Fluxless reflow				X	X									
	Flip Chip Epoxy Cure		X					X	X		X				
	LED Low Void Solder			X											
	Semi Curing (DAF, underfill, etc)		X					X						X	
	Curing (Panel, Copper Plate)								X						X
	Low Void Curing								X		X				
	TIM Attach				X					X					

01

Horizontal Reflow /
Horizontal Cure

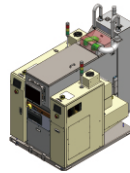
02

PRO



03

Batch Cure



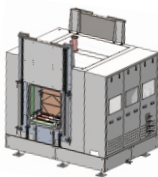
04

Horizontal Cure



09

HCO



08

PCO

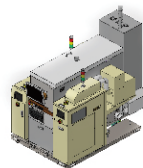


07

Horizontal
Vacuum Reflow

06

Snap Cure



05

VCO



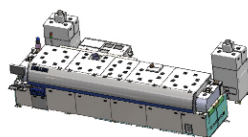
10

Formic / Forming Gas



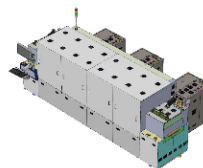
11

Formic Vacuum



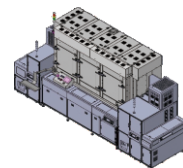
12

VEFO



13

HMO



• Vacuum Oven Spec 真空回流炉规格参数

	1808MK5-VR	1911MK5-VR	1912MK5-VR	1936MK5-VR	2043MK5-VR	2156MK5-VR
Basic Data 基本数据						
Length (mm)	4,650	5,900	5,900	5,890	6,780	8,690
Width (mm)	1,520	1,520	1,520	1,520	1,520	1,700
Height (mm)	1,600	1,600	1,600	1,600	1,600	1,600
Weight (kg)	3,240	3,600	3,600	2,900	4,330	5,300
Power and N ₂ 电源和氮气						
Power Inputs	208/240/380/400/415/440/480 VAC (50HZ/60HZ)					
Max Current Draw	130Amp @ 208V ~ 240V*** 100Amp @ 380V ~ 480V***			200Amp @ 208V ~ 240V*** 130Amp @ 380V ~ 480V***		
Continuous Power kW	7-14	10-16	10-16	9-15	13-20	15-28
Nitrogen Supply Pressure (bar)	5-7					
Nitrogen Operating Pressure (bar)	6					
Typical Nitrogen Consumption**	500-700SCFH					
Vacuum Pump	(need to check detail layout for vacuum oven)					
Length x Width x Height (mm)	1752 x 767 x 695					
Weight (kg)	330					
Power Inputs	208V ~ 480V (50HZ/60HZ)***					
Max Current Draw	20Amp					
Continuous Power kW	4-7					
Vacuum Pump Nomiral Speed M³/hr	280(50HZ) / 340(60HZ)					
Vacuum Pressure/Speed Control	5-step Pressure / Speed Control					
Heating and Cooling 加热和冷却						
Heating Zones*	7	10	11	8	10	15
Heating Length (mm)*	1,930	2,870	3,090	2,860	3,590	5,170
Cooling Zones*	2	3	3	3	3	4
Cooling Length (mm) (Air/N2)*	830	1110	1070	1,290	1,270	1,520
Max.Temp (°C)	350/450					
Accuracy of Temp. Control (°C)	+/-0.1					
Profile Change Time (min)	5-15					
Vacuum Chamber 真空室						
STD Chamber Size (L x W, mm)	500x450	500x450	350x450	350x450	500x450	600x600
Option Chamber Size (L x W, mm)*	/				600x600	500x450
Vacuum Chamber Heating	3-Zone IR					
Vacuum Chamber Heating Power (kW)	9.5	9.5	7	7	9.5	13.5
Vacuum Chamber Max. Setting Temp.(°C)*	400, option 480					
Vacuum Chamber Pressure	10 Torr(13.3mbar), Option 5 Torr(6.65mbar)					
PCB Support PCB支持						
Single Lane / MeshBelt*	100-450	100-450	100-450	100-450	100-450	100-600
Dual Lane in Single Lane Mode*	100-240	100-240	100-240	100-240	100-240	100-400
Dual Lane in Dual Lane Mode*	100-170	100-170	100-170	100-170	100-170	100-250
Min. Board Length*	150, option 120					
Dual Lane Rails*	FMMF, FMFM					
PCB Direction	LtoR, RtoL					
PCB Clearance (mm)*	Meshbelt: Top 38, Option Top 58 Chain: Top 29/Bot 29, Option Top 35 /Bot 35 Chain with CBS: Top 29/Bot 10					
Transportation Height (mm)*	Meshbelt: 930+/-60 Chain: 960+/-60(Chain), Option 900+/-60					
Conveyor Speed (mm/min)*	250-1,880					
Length of PCB Support Pins (mm)*	4.75					
Auto Lubrication System	S					
Power Width Adjustment	S					
KIC Profiling Software	S					
*Other Special Option is possbile						
**Varies with PPM, PCB size and oven configuration						
***Voltage: 208V/240V/380V/400V/415V/440V/480V						

high temp. with side chain(MB or Rod) or Multi-Stage Conveyor system

S: Standard

Please note that the specifications and parameters of the actual product mentioned in this promotional brochure are subject to potential variations and changes. 请注意, 本宣传手册中提到的实际产品的规格和参数可能会发生变化。

HELLER INDUSTRIES, INC.

HELLER US 美国总部

Eastern Office Tel: +1 973 377 6800
Western Office Tel: +1 512 567 4371
info@hellerindustries.com
4 Vreeland Road Florham Park, New Jersey 07932

HELLER KOREA 韩国

Office Tel: +82 31 769 0808
info@hellerindustries.co.kr
125-5, Saneop-ro 156 Beon-gil, Gwonseon-gu, Suwon-si, Gyeonggi-do, Korea

HELLER SHANGHAI 中国(上海)

Office Tel: +86 21 6442 6180
info@hellerindustries.com.cn
No.227, Min Qiang Road, Song Jiang District, Shanghai, China
上海市松江区民强路227号

HELLER TAIWAN 中国(台湾)

Office Tel: +886 3 4757585
info@hellerindustries.com.cn
No.6, Lane 740, Gaoshi Road, Yangmei District, Taoyuan City, Taiwan, China
台湾桃园市杨梅区高狮路740巷6号

HELLER EUROPE 欧洲

Office Tel: +441 16 223 8107
info@hellerindustries.com

HELLER JAPAN 日本

Office Tel: +81 3 6717 4001
info@hellerindustries.com



HELLER微信公众号



HELLER官网