HELLER
INDUSTRIES

HELLER VACUUM REFLOW OVEN

The Thermal Technology Leader in Semicon and SMT

www.hellerindustries.com

HELLER——
LEADER IN THERMAL PROCESS SOLUTIONS

HELLER US

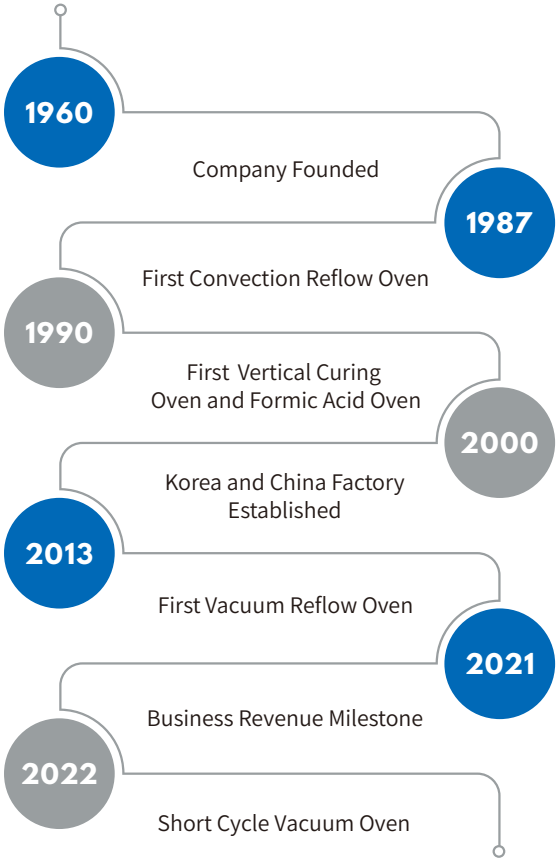
HELLER KOREA

HELLER CHINA

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.

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.

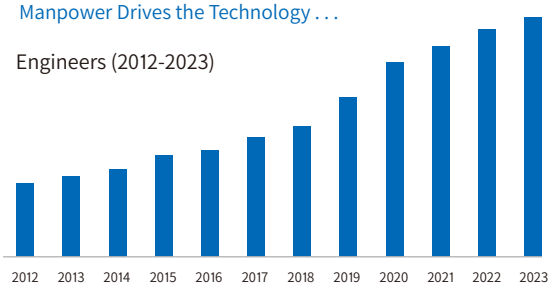
A CULTURE OF CUSTOMER FOCUS - HELLER is committed to providing its customers the best possible solution for their applications through fully configurable and customized products to meet their unique requirements and give them the competitive advantage they require.



WHY PARTNER WITH HELLER?

A Continuous Investment in Engineering Manpower Drives the Technology . . .

Engineers (2012-2023)



Market Leader
Presenting in Soldering and Curing Systems for SMT and Semicon. Worldwide Footprint - Be Global and Local ("Glocal")

Advanced Technology
Partnering with Leading Companies to Drive New Manufacturing Technology, and Helping their Competitive Advantages.

Strong Capability
Being able to Innovate and Customize Quickly, Easy to Work With.

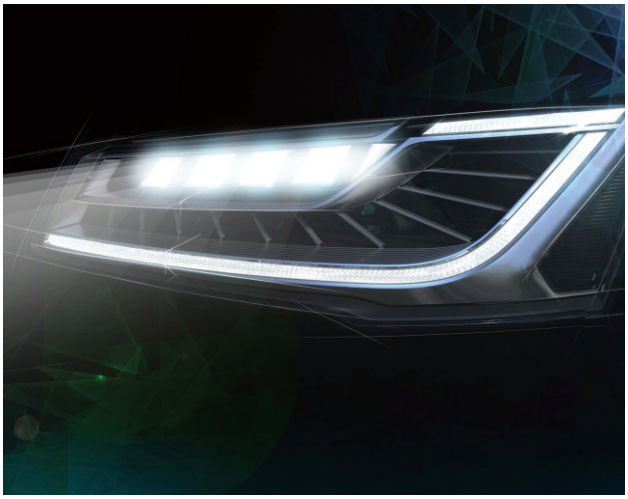
Green Technology
Environmentally Conscious / Sustainability Focus and Designs

2020 Global Surface Mount Technology Soldering Equipment Award

2021 Service Excellence Award

• Drivers for High Reliability Production

Rapidly growing markets such as Automotive Electronics, LEDs, and Power Electronics are experiencing a surge in demand for device performance alongside rising reliability standards. Consequently, manufacturers must ensure void-free soldering to meet these stringent reliability requirements.



Vacuum reflow soldering remains one of the best approaches for reducing solder void rates.

• Factors that Affect Voids and Void Types

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.

A

Paste

Alloy

Flux

B

PCB and Components

PCB and finish

Component material

PCB Pad design

C

SMT Process

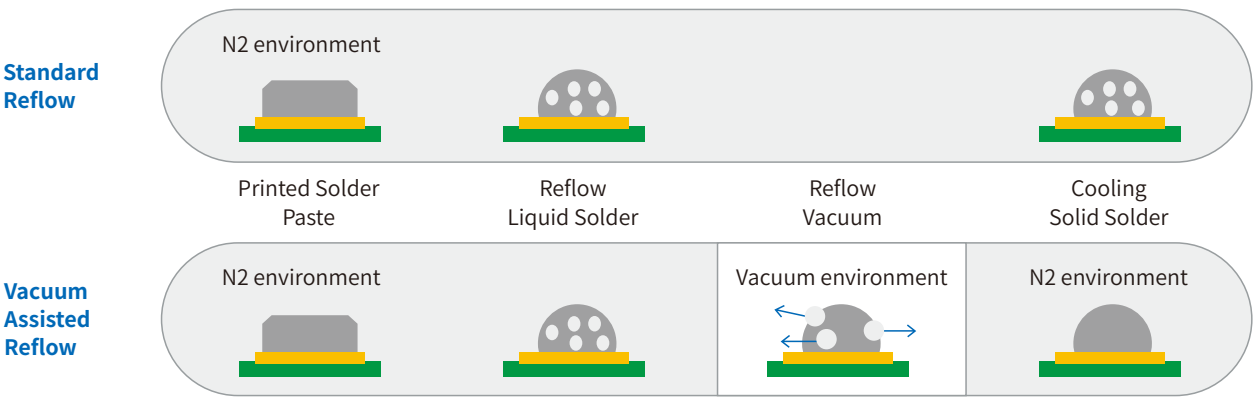
Printing

Placement

Reflow Profile

• Principle for Void Removal by Vacuum

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.



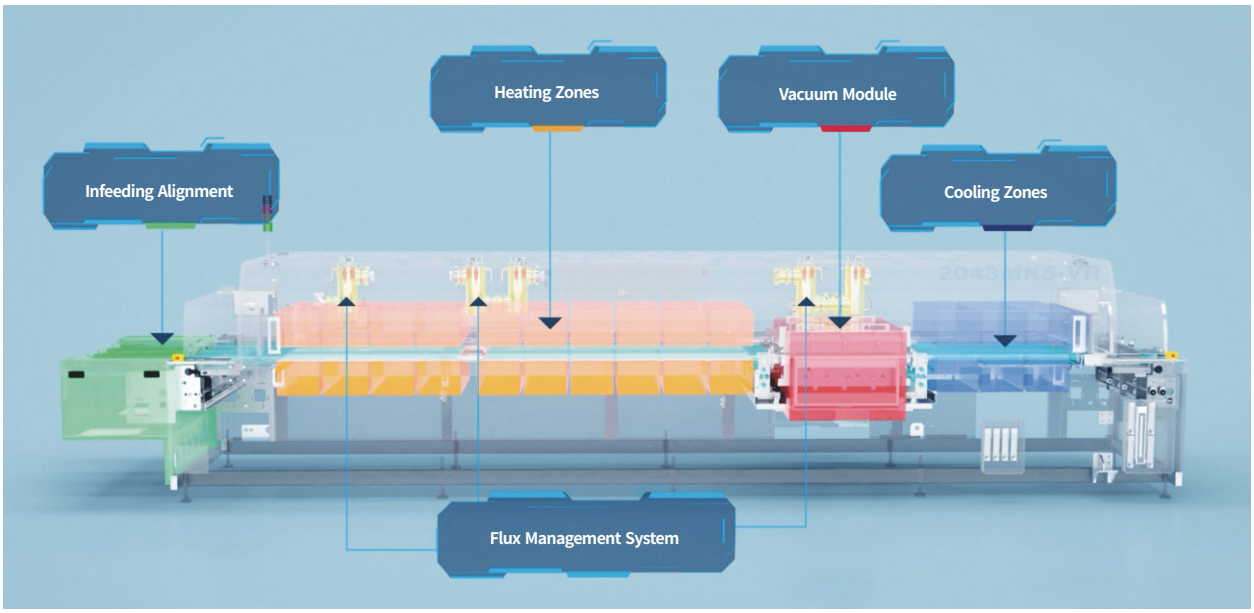
Gas bubbles in liquid solder increase in size as pressure is reduced.

Bubbles combine with other bubbles, increasing in size until they ultimately collide with the edge of the liquid solder and escape.

As bubbles get larger they become more buoyant, making them more likely to escape.

HELLER VACUUM REFLOW OVEN

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.



Flexible Design

Compatible and configurable for your specific requirement

Uniform Temp. Profile

Lower delta T's and easily adjusted thermal profile

Fast Heat Transfer

Fast response to heat transfer for any product, delivering the highest soldering quality

Easy PM Effort

Less downtime for more productivity

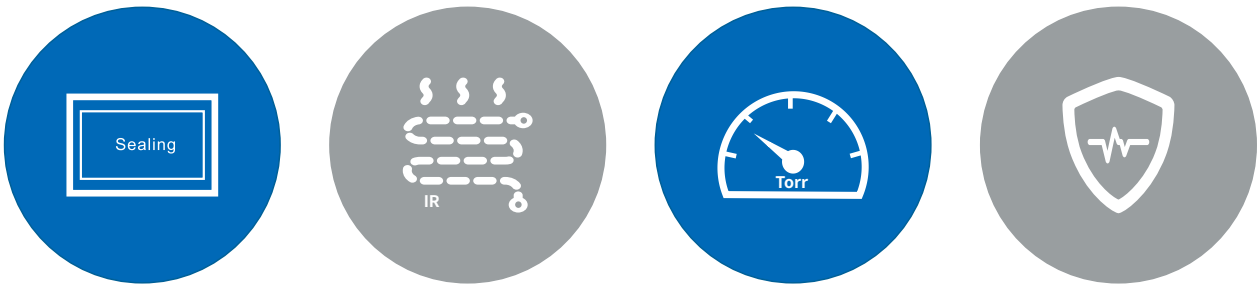
Low CoO

Reduced energy and Nitrogen consumption at any PPM level

Smart Factory Ready

Providing oven data to superior SW for smart data analysis and smart control

• Key Factors for Vacuum Reflowing



Sealing Performance

Heating Capability in Vacuum Chamber

Vacuum Capability and Vacuum Control

Transportation Control

HELLER vacuum ovens have the hardware capabilities to ensure the highest process quality.

01 Sealing Performance

• High Sealing Performance of HELLER Vacuum Chamber

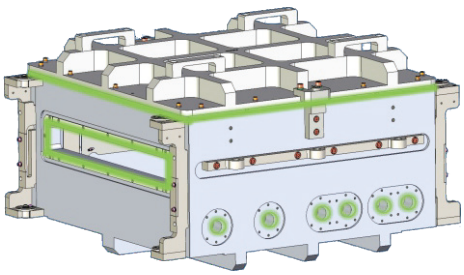
A

High Sealing Performance
Advanced mechanical designs with materials suitable for high temps ensures the best sealing performance when vacuum is activated.

B

Single-Piece Machined Aluminum Chamber
CNC machined one-piece vacuum chamber with gas cooling system, ensures sealing performance and structure integrity.

Design of vacuum chamber



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.

02 Heating Capability In Vacuum Chamber

• Shorter Time Above Liquidus with IR Chamber Heating

A

Heating Capability in Chamber

- 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.

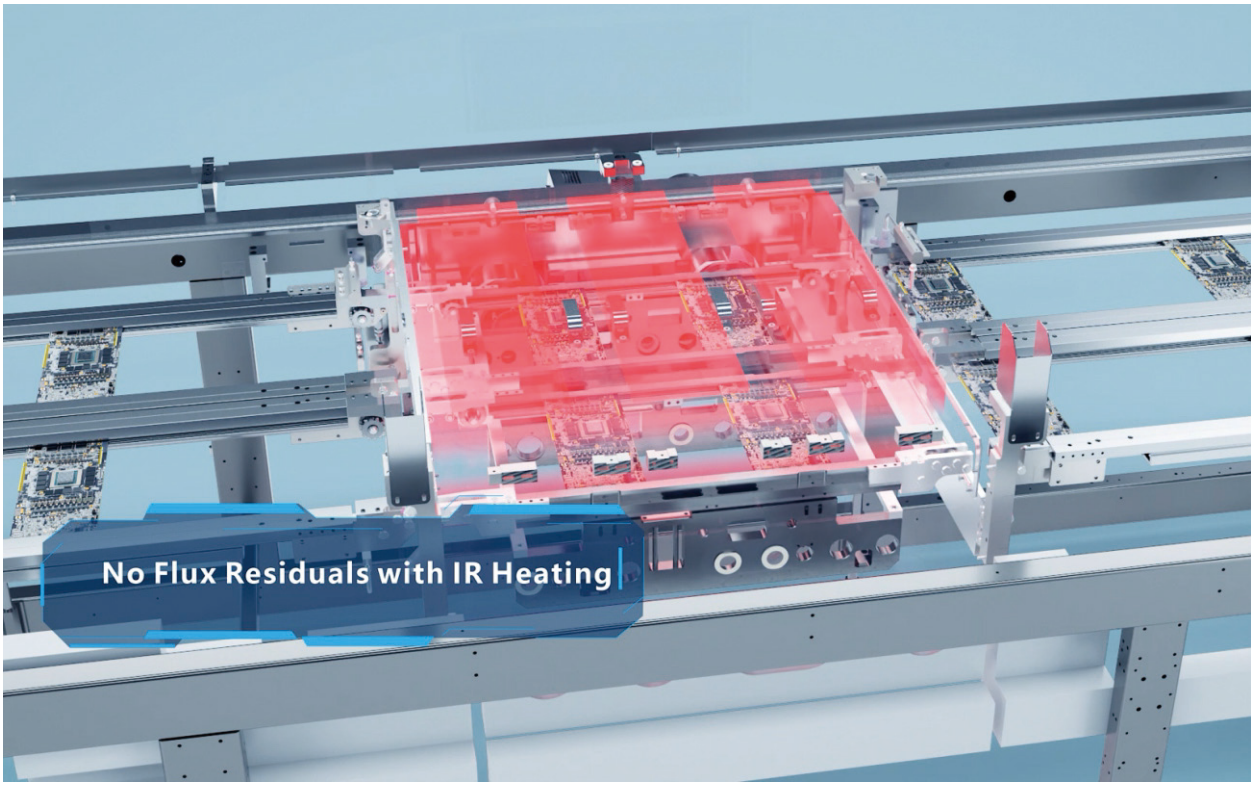
B

Easy Maintenance

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

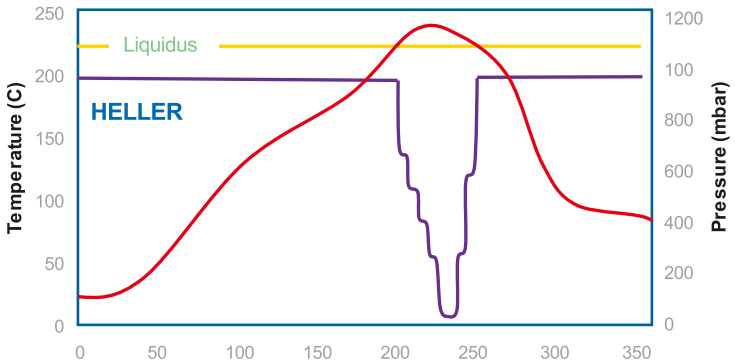
HELLER vacuum IR heaters enable temps as high as 450°C, and allow peak inside vacuum chamber.

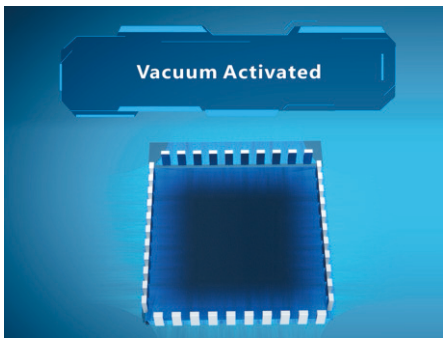
3-zone IR panel inside vacuum chamber



03 Vacuum Capability and Vacuum Control

• Closed Loop Pressure Control Prevents Splatter and Solder Balls



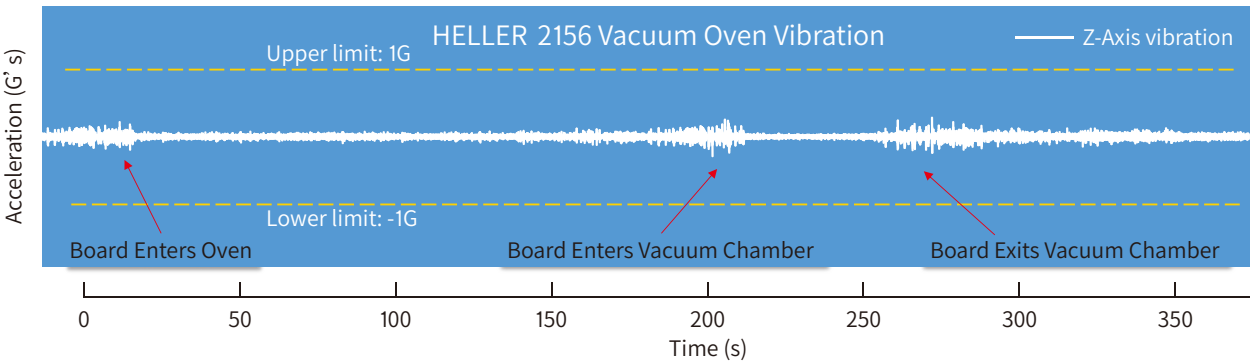


HELLER Temperature and Vacuum Control

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.

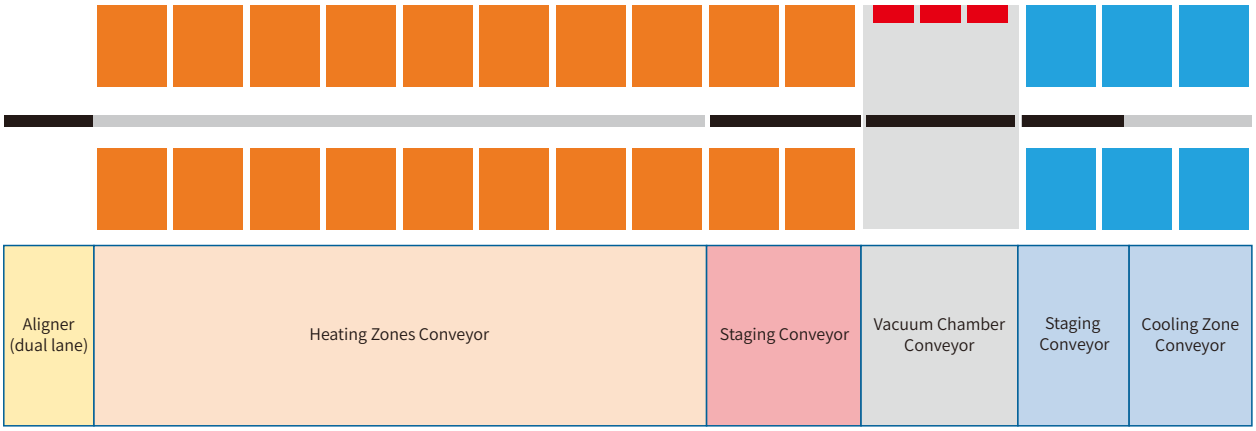
04 Transportation Control

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



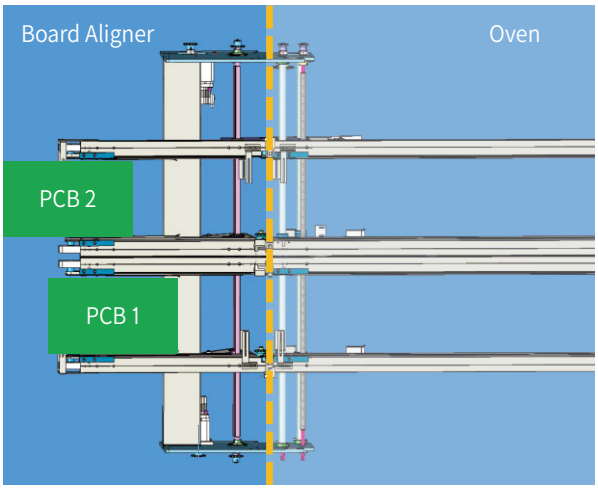
• Short Cycle Conveyor System for High UPH

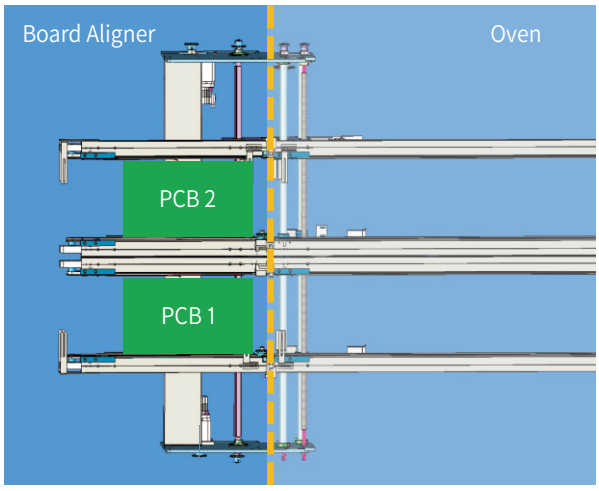
HELLER's new high-UPH Short Cycle conveyor system dramatically increases throughput by utilizing 5 independently controlled conveyor systems. The oven's staging conveyors move boards quickly into and out of the vacuum chamber, reducing cycle times buy up to 50%. For typically use cases, throughput improvements 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.



• Board Aligner for High Utilization

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.

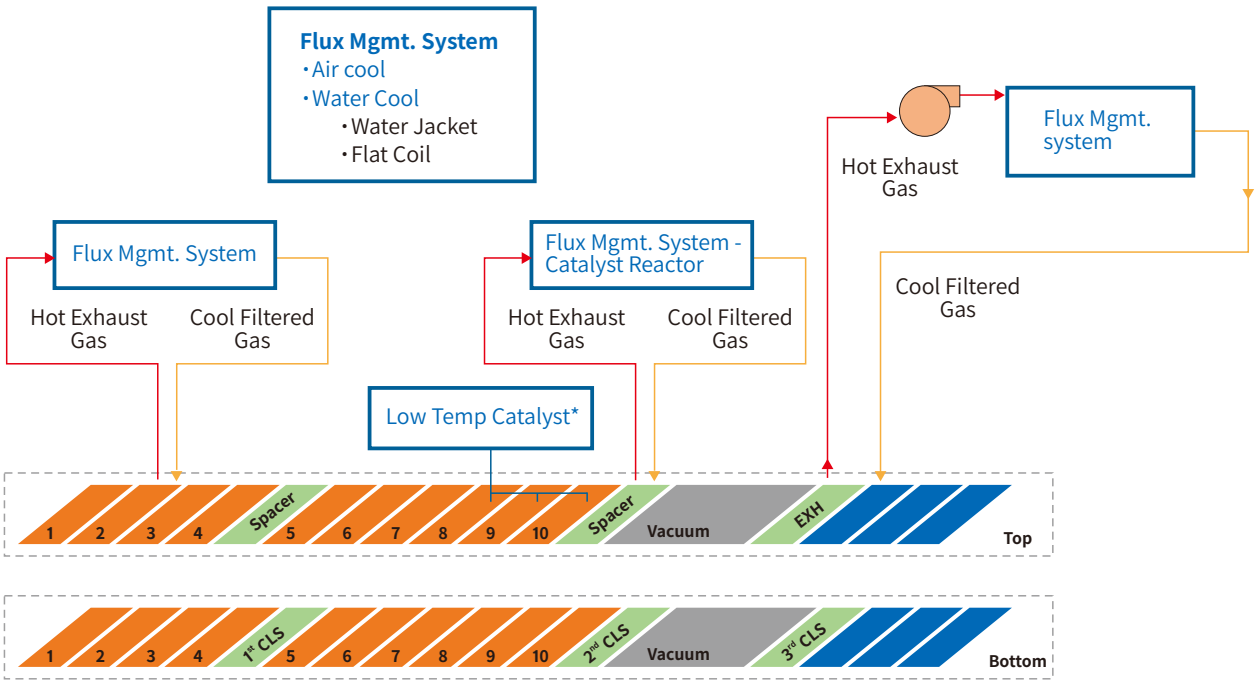




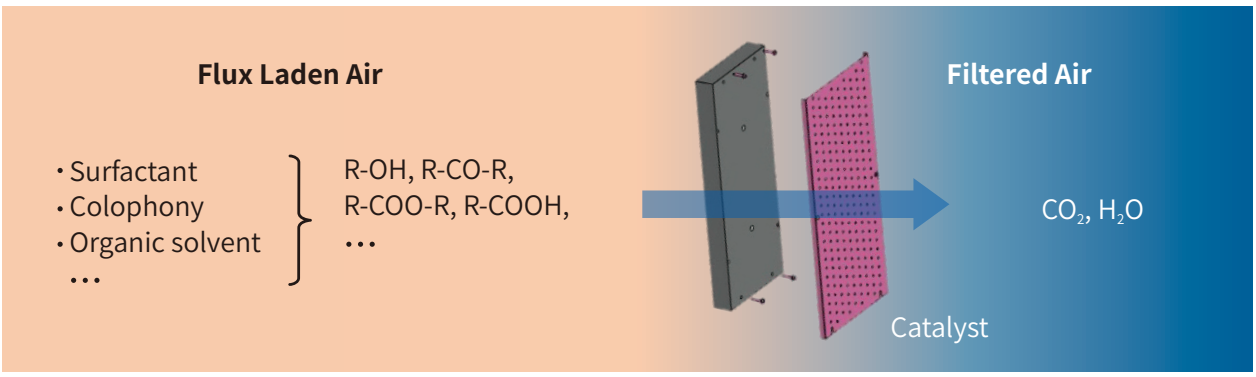
Additional Features

• Flux Management System

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 maintenace intervals and shortening required maintenance times.



2043MK7 Machine Layout
* option

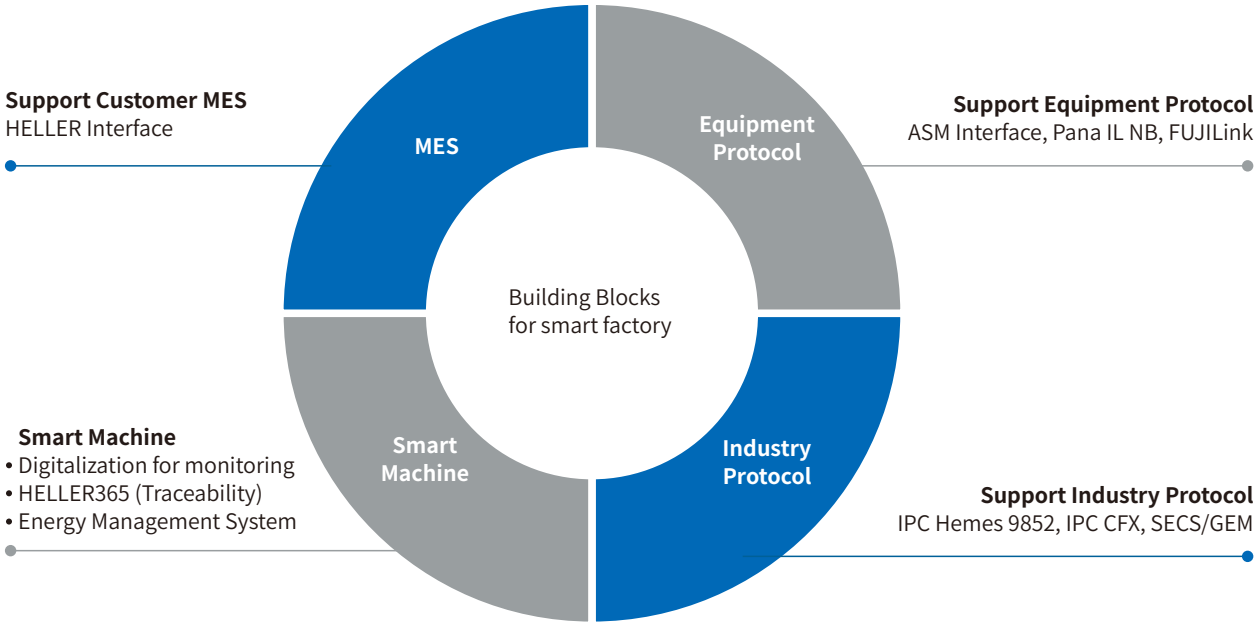


HELLER has developed the new “Low Temperature Catalyst” flux management solution. The catalyst breaks down and removes flux volatiles through a chemical reaction turning them into harmless byproducts (CO2 and water).

The catalyst helps keep the oven chamber clean from flux residue and prolongs the period required for flux-related maintenance.

• Smart System for Smart Manufacturing

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.



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.

HELLER365 (Traceability)

HELLER365

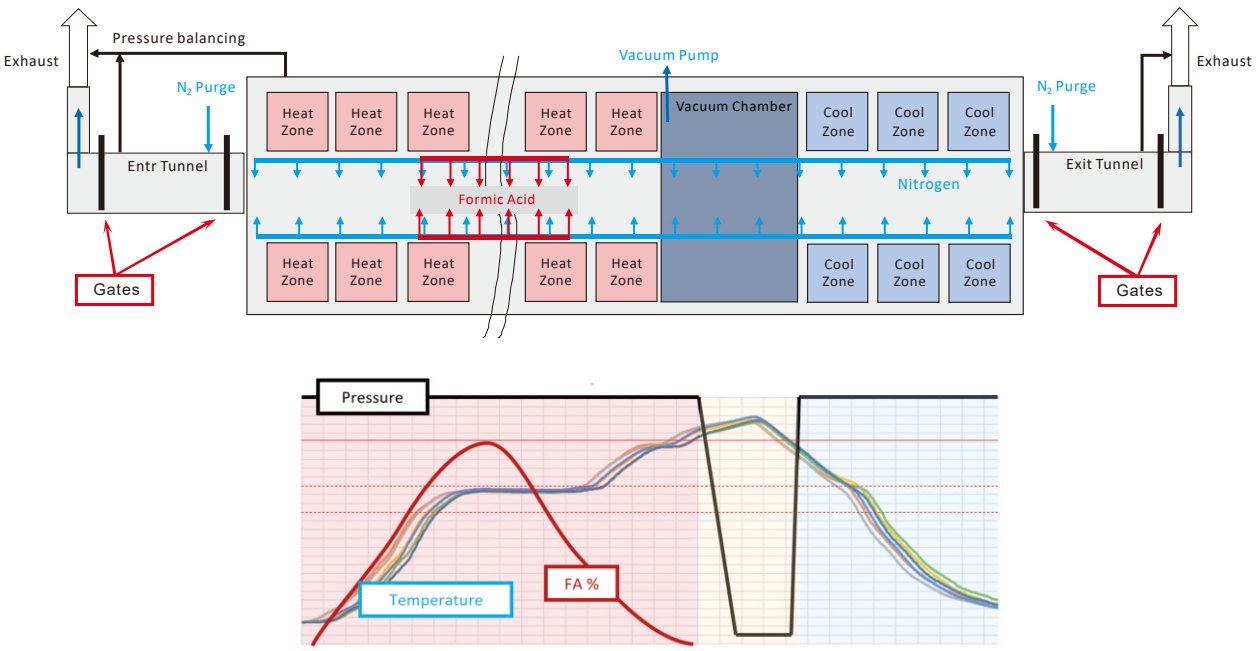
Virtual Profile - Board Level Monitoring

HELLER ovens also support 3rd party solutions such as KIC RPI.

• Vacuum + Formic Acid Solution for Flux-Free Process

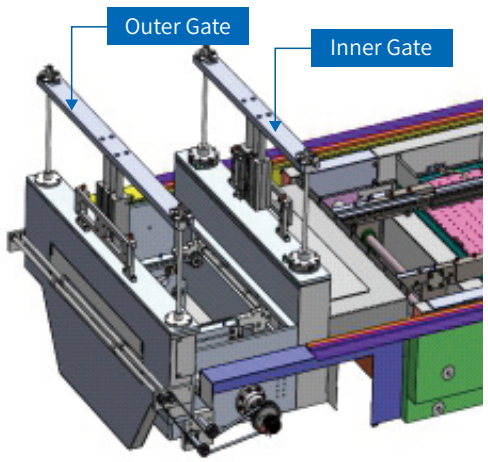
HELLER proudly presents VFAR, a horizontal fluxless formic reflow oven with vacuum capability. This state-of-the-art oven combines all of the benefits of vacuum reflow and fluxless reflow for the lowest void rates and highest product quality. The oven aheres to all SEMI S2/S8 safety standards, including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

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.

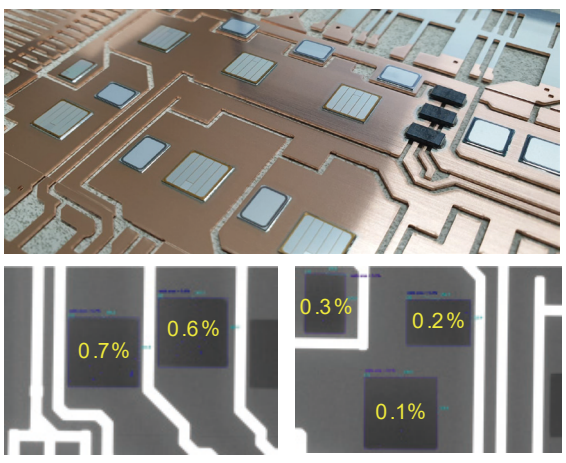


Profile of Vacuum Formic Acid Reflow

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.



Formic Gate System

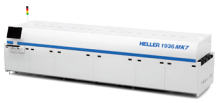


Void rate results for IGBT and Solder Preform on VFAR

• HELLER Product and Application Matrix

Market Segment	Applications	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& Electronics Assembly	Solder Reflow	O													
	Low Void Solder Reflow			O											
	Epoxy Curing		O					O				O	O		
	Low Void Epoxy Curing								O						
Power Electronics	IGBT Assembly				O	O	O								
	Low Void Soldering			O											
Semiconductor Packaging	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)

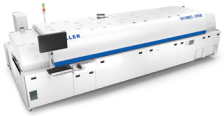
09 Pressure Reflow Oven (PRO)

08 Pressure Curing Oven (PCO)

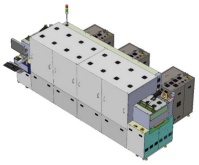
07 Vertical Curing Oven (VCO)

06 Vacuum Forming Gas Reflow Oven

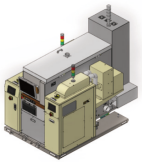
05 Vacuum Formic Acid Reflow Oven (VFAR)



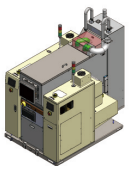
10 Vacuum Epoxy Flowout Oven (VEFO)



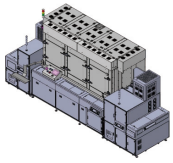
11 Snap Curing Oven



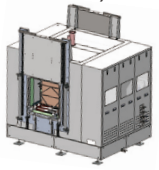
12 Batch Curing Oven



13 Heller Magazine Oven (HMO)



14 Heller Curing Oven (HCO)



• Vacuum Oven Spec

	1808MK5-VR	1911MK5-VR	1912MK5-VR	1936MK5-VR	2043MK5-VR	2156MK5-VR
Basic Data						
Length (mm)	4,660	5,900	5,900	5,900	6,780	8,700
Width (mm)***	1,720	1,720	1,720	1,720	1,720	1,930
Height (mm)	1,635	1,635	1,635	1,635	1,635	1,635
Weight (kg)*****	3,360	3,760	3,670	3,620	3,850	5,700
Power and N_2						
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)	1,750 x 770 x 690					
Weight (kg)	330					
Power Inputs	208V ~ 480V (50Hz/60Hz)***					
Max Current Draw	20					
Continuous Power kW	4-7					
Vacuum Pump Nomiral Speed M^3/hr	280(50Hz) / 340(60Hz)					
Vacuum Pressure/Speed Control	5步真空控制 / 速度控制					
Heating and Cooling						
Heating Zones*	7	10	11	8	10	15
Heating Length (mm)*	1,930	2,875	3,040	2,865	3,590	5,170
Cooling Zones*	2	3	3	3	3	4
Cooling Length (mm)*	830	1,115	1,095	1,285	1,270	1,520
Max.Temp (°C)	350/450					
Accuracy of Temp. Control (°C)	+/-0.1					
Profile Change Time (min)	5-15					
Vacuum Chamber						
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						
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 58, Option Top 38 Chain: ±29, Option ±35 Chain with CBS: +29/-10					
Transportation Height (mm)*	Meshbelt: 930+/-60 Chain: 960+/-60, 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 Options	High temp. with side chain(MB or Rod) or High Throughput Rapid Cycle Conveyor system					

*Special option per request

**Varies with PPM, PCB size and oven configuration

***Varies from vacumm chamber size and vacuum pump is not included

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

*****Oven weight varies upon actual configurations

S: Standard

Please note specifications for air ovens and N2 ovens may vary, and specifications of the actual product may vary from those listed in this promotional brochure due to product improvements or technical updates. For the latest information, please contact us.

www.hellerindustries.com

HELLER INDUSTRIES, INC.

HELLER US

Eastern Ofice 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

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

Office Tel: +86 21 6442 6180
info@hellerindustries.com.cn
No.227, Minqiang Road, Songjiang District, Shanghai, China

HELLER TAIWAN

Office Tel: +886 3 4757585
info@hellerindustries.com.cn
No.6, Lane 740, Gaoshi Road, Yangmei District, Taoyuan City, Taiwan

HELLER EUROPE

Office Tel: +44 777 55 11 008/+36 30 274 2609
info@hellerindustries.com

HELLER JAPAN

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