

THE ALL-NEW
GKG PRINTER

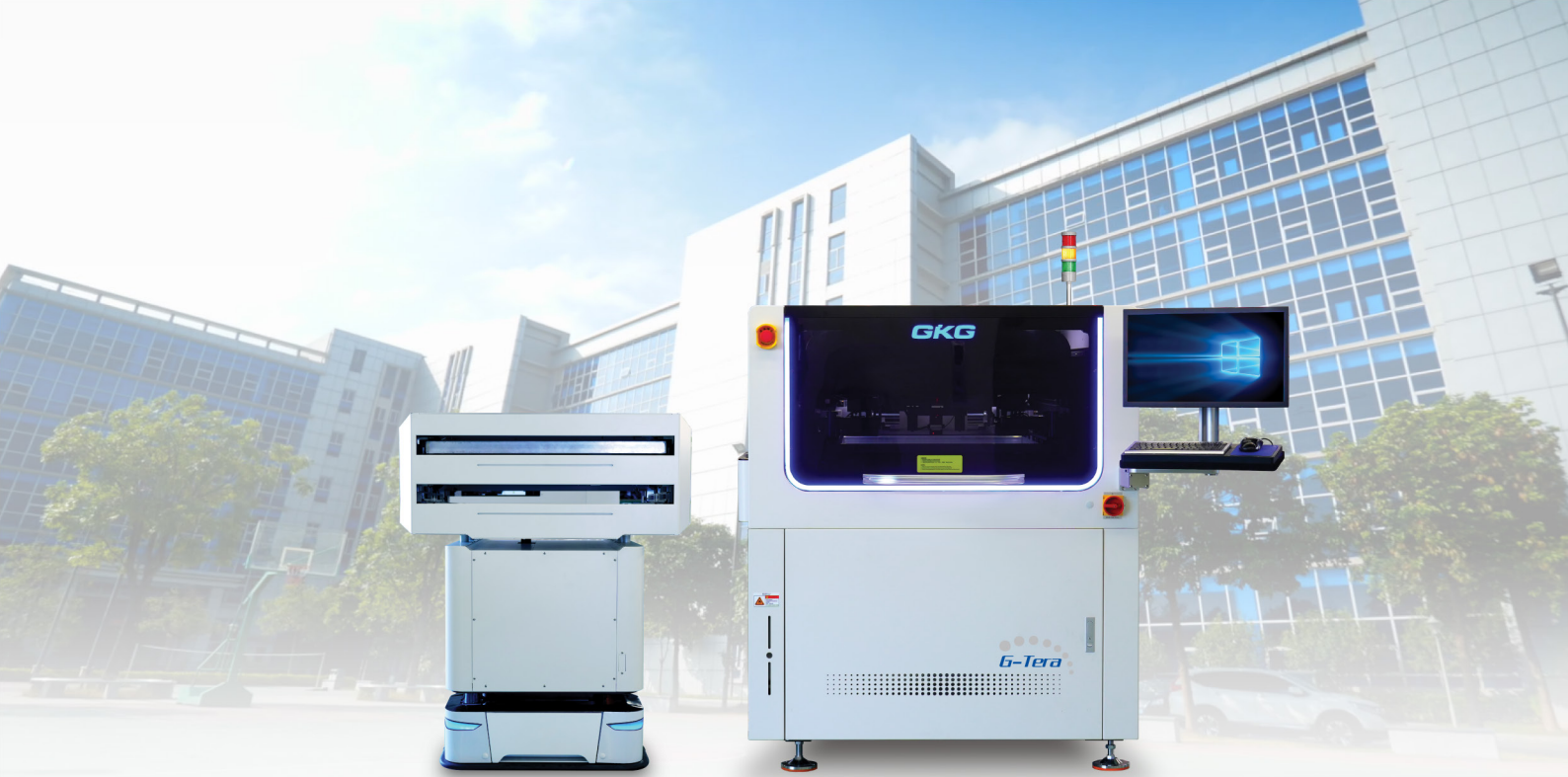
ULTRA PRECISION
HIGH SPEED

G-Tera



GKG *Embracing Future Technology*

www.gkgasia.com



Our arduous but rewarding journey of G-Tera

In recent years, due to the cost effectiveness of mini-LEDs being used on large-sized display, automotive display, Smart Television, laptop and smartphone's backlight module, mini-LED manufacturing is entering the mass commercial market.

The miniaturization of PCB design for portable and wearable consumer gadgets also drives the components size down to 0201 (metrics). The challenge of solder paste printing on ultra-fine substrates, with stencil aperture openings ranging from 150 microns down to 50 microns, required us to systematically revamp our paste printing machine.

Through countless experiments and testing, we realized that, in addition to X-Y accuracy, precise control of the Z axis (the 3rd dimension) across the substrate, stencil, and squeegee (The Backbone) is crucial. This control ensures ultra-tight coplanarity between the stencil and substrate, which is essential for maintaining consistent solder paste volume deposition in every print cycle. Intermittent vibrations on the production floor or fluctuations in electricity supply during printing can lead to defects if the Z axis is not consistently monitored and maintained within tight tolerances.

The global EMS companies are facing great challenges to satisfy their customer's growing demand of both product quality with traceability as well as the flexibility of high mix, quick change over time and high productivity with high speed in order to stay ahead of the severe competition.

GKG put together, a team of more than 30 R&D engineers to work with some of the global EMS companies for more than 15 years. We had acquired deeply, the knowledge of paste printing technique through our countless involvement and experience together with our customers, for the qualification of their stringent requirements.

The debut of G-Tera provides a timely solution for the future challenges of paste printing which must be seriously dealt with as the first priority in the entire SMT production process control.

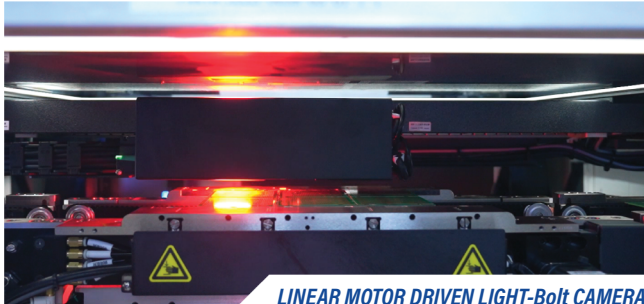
G-Tera is designed with unmatched SPEED, ACCURACY, STABILITY, CAPABILITY, and FUTURE-PROOF solution.



LIGHTNING SPEED

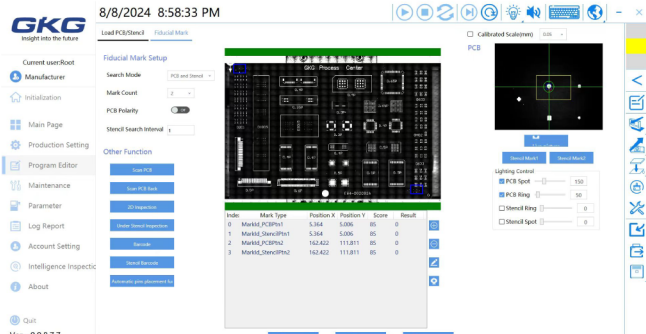
Core Cycle Time : 5.2 secs
Actual Cycle Time : 12.5 secs (PCB Size 200mm x 154.5mm + 1 wipe)

With the latest motion control architecture, the speed of G-Tera is being cranked up by more than 30%



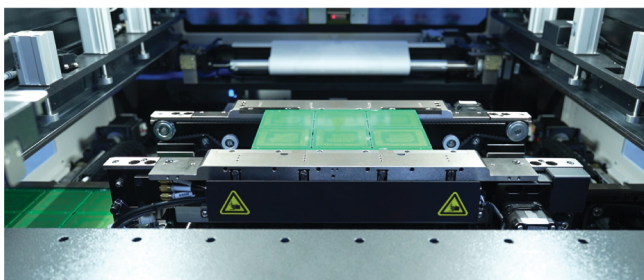
LINEAR MOTOR DRIVEN LIGHT-Bolt CAMERA

The upgraded linear motor driven "LIGHT-Bolt" fiducial camera (3.0 megapixel, FOV: 8 x 10mm) move and capture stencil and PCB marks concurrently at lightning speed. "LIGHT-bolt" camera can also scan the PCB on-the-fly to formulate complete PCB image to shorten the time for creating new printing programs and 2D paste inspection programs.

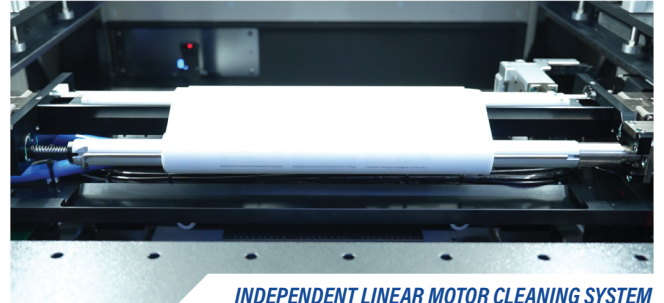


PCB IMAGE SCANNED BY LIGHT-Bolt CAMERA ON-THE-FLY

The conveyor **Single-stage or 3-stage mode** is automatically generated by programming. If PCB length is within 265mm, 3-stage mode will be adopted to cut down loading and unloading time to achieve core cycle time of just 5.2 secs. Optionally, with in/out rail stage extension of 135mm on both side, up to 400mm PCB length can adopt 3-stage mode. Single-stage mode can print PCB size up to 510mmx510mm.



SINGLE-STAGE / 3-STAGE MODE SWITCHABLE CONVEYOR SYSTEM



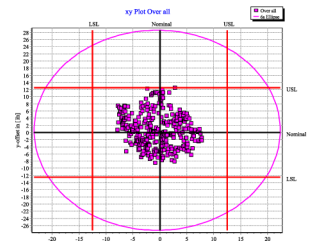
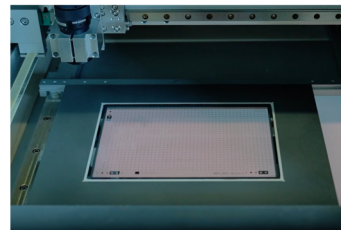
INDEPENDENT LINEAR MOTOR CLEANING SYSTEM

With the upgraded **Independent Linear Motor Driven Under Stencil Cleaning System** Actual cycle time to print a 200mm(L) x 154.5mm(W) PCB with squeegee travel speed set at 150mm/sec plus 1 complete wipe cycle is just 12.5 seconds. (Fastest in the industries)

UNMATCHED ACCURACY

± 8 μm Total System Alignment Accuracy
± 12.5 μm Wet Print Repeatability ≥2 Cpk @ 6 sigma

G-Tera has built-in ±8 microns alignment, and ±12.5 microns wet print repeatability ≥2 Cpk@6 sigma proven through CeTaQ 3rd party print capability analysis testing, using a dedicated glass plate fixture print with red glue.



2 Tester: Ganglin Li
Date: March 14, 2024

Serial No.: 004CY
Line: G-Tera

1 Summary

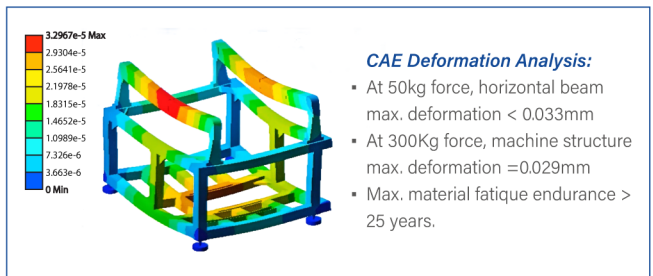
Over all Over all				
Board-to-Board Repeatability				
Characteristic	Specification	C_m Goal	C_{mk} Goal	Result
x-offset	-12.5 μm ... 12.5 μm	3.57	3.43	PASSED
y-offset	-12.5 μm ... 12.5 μm	2.53	2.40	PASSED
Number of Measurements		336		

Table 1: Capability Values Final State

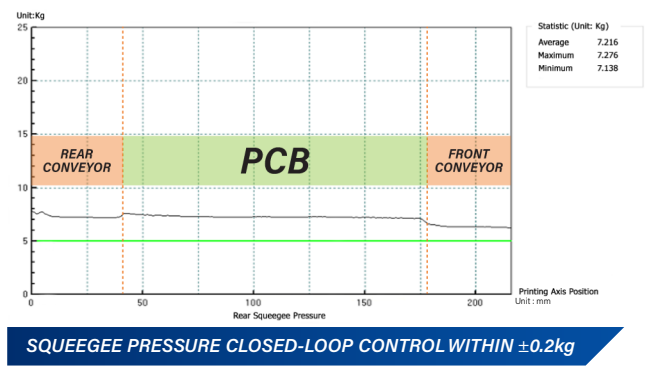
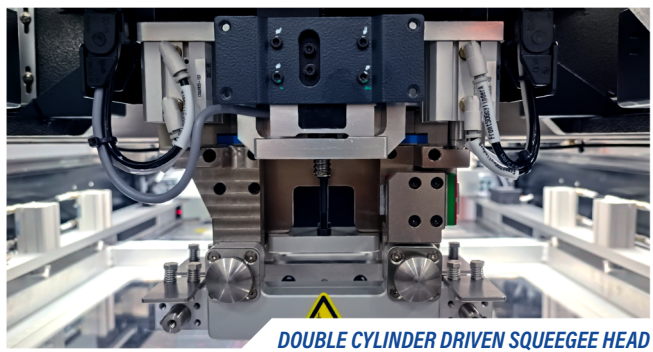
This is almost 30% better in wet print accuracy over current best-in-class solder paste printer. With this top-notch accuracy and repeatability, G-Tera is still able to cater up to a maximum PCB size of 510mm x 510mm, making G-Tera the most flexible and adoptable printer for the electronic assembly industries.

SOLID STABILITY

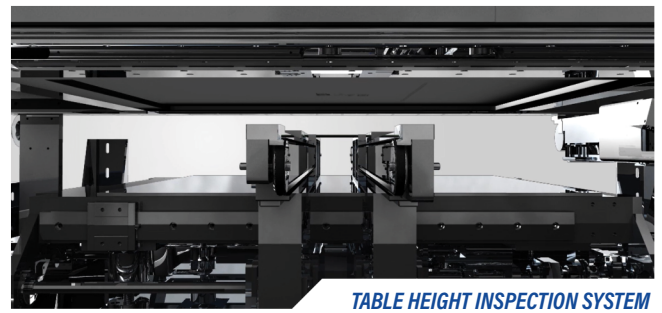
GKG printers are built to last for more than 25 years. The rigid machine body structure with machine total net weight stands at about **1,250~1,300kg** can better counter all high speed movement and production floor vibration (Other manufacturer's printers are mostly around 600~800Kg in weight). This solid foundation greatly ensured long lasting stability without the need of periodical machine calibration by software.



The new **Advance Closed-loop Print Head** supported with double cylinder drive has the optimum release behavior that enhances the printing stability for large size PCB. It also comes with "Real Time Closed-loop Squeegee Pressure Control System" that can control the printing pressure within $\pm 0.2\text{kg}$.



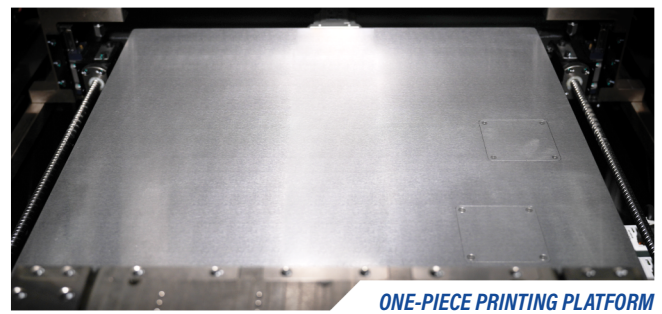
G-Tera comes with real time **Print Table Height (Z axis) Monitoring System**, which control the print table up/down accuracy within 15 microns.



Stencil Lock uses vacuum hold-down mechanism to locked the stencil firmly by vacuum on both sides of the conveyor rail to achieve firm contact with PCB during printing to eliminate the stencil "waving" effect.



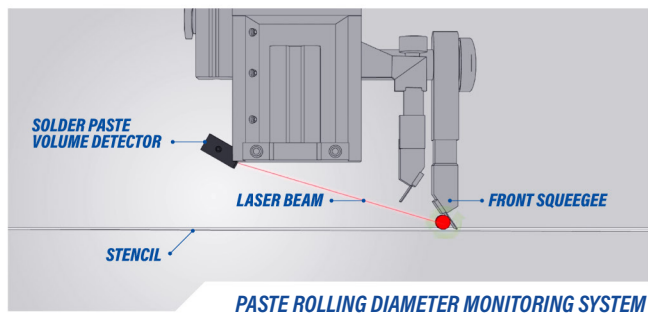
The newly refined **One-Piece Printing Platform** improved the levelling accuracy from 50 microns down to 20 microns.



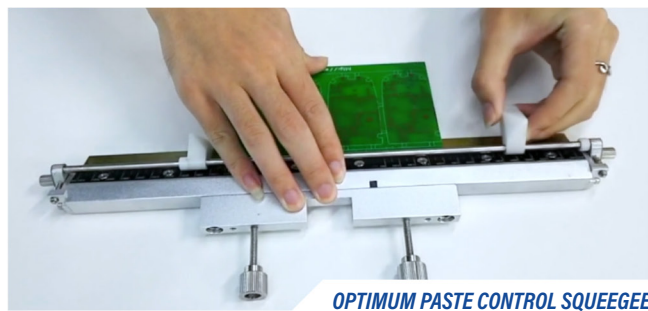
The built in **Real Time Current, Voltage, Vacuum Suction Monitoring Functions** minimise defects caused by power supply instability and improper under stencil cleaning due to the lack of maintenance.

VERSATILE CAPABILITY

Other standard features contribute to the capability of G-Tera are: **Paste Rolling Diameter Monitoring System** is for the real time monitoring of the paste rolling diameter within a controlled range of 10mm to 15mm, so as to maintain an optimum paste quantity on the stencil to maintain desire rolling speed at all time during printing for the best quality control.



Optimum-Paste-Control (OPC) Squeegee with adjustable retainers on both side, the OPC squeegee can retain the solder paste within the exact length of each PCB model. The absolute control over desire printing area with clean sweep leaving no stagnant solder paste at both side of the stencil after printing which lead to better quality paste without wastage. 2 pairs of OPC squeegee (300mm and 450mm) are included as standard for G-Tera.

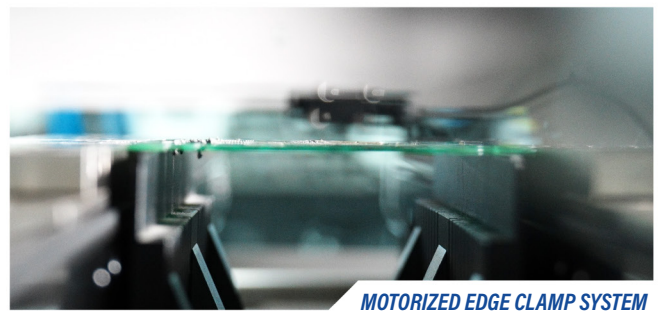


Special Paperless Self-Cleaning Under Stencil Cleaner combined with a secondary wet lint-free paper cleaner powered by strong venturi vacuum generator, greatly improve the cleaning results and drastically reduced the usage of IPA and lint free paper that could result in more than 24 hours of continuous operation without human intervention.

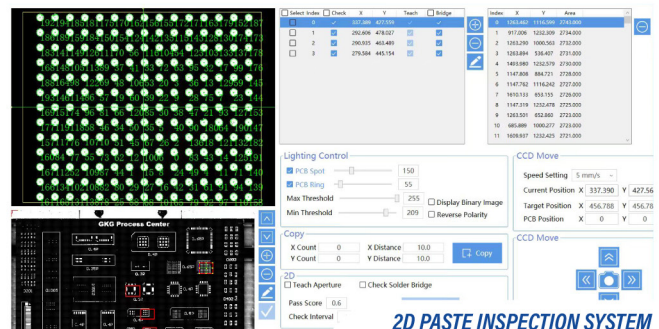


2 in 1 Paperless Cleaning Structure

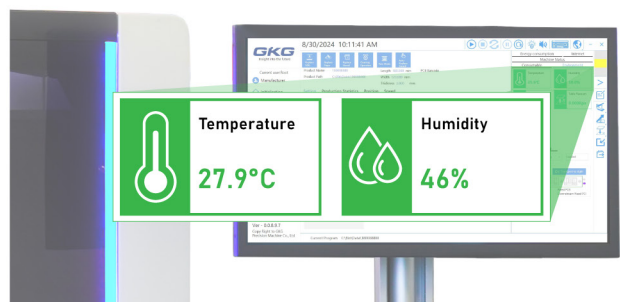
Motorized Auto Edge Clamp System can control the PCB clamping force numerically to give a consistent edge to edge print without using top clamp that create a gap between PCB and stencil which interfere the contact printing. A safely hidden fixed top foil clamp at both side of the conveyor edge can be slide out manually and used concurrently with motorized auto edge clamp for PCB thickness that is less than 0.6mm during new product introduction (NPI) without dedicated vacuum block being made in advance.



2D paste inspection software for post printing solder paste coverage area inspection on critical components such as BGA, QFP.



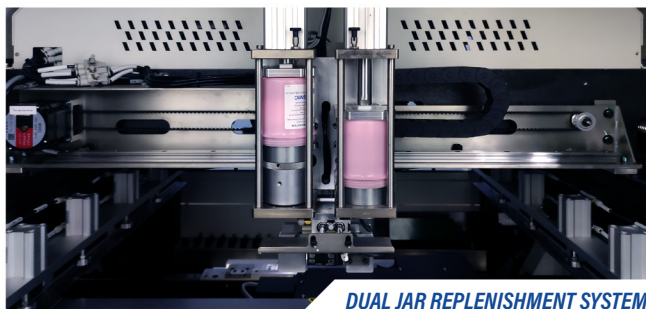
G-Tera also comes with **Temperature And Humidity Monitoring With Display; Cleaning Paper Roll Diameter Monitoring; IPA fluid level monitoring; Back to back (BTB) configuration** for dual lane SMT line as standard.



FUTURE-PROOF SOLUTION

Optional features are available to allow factory scaling towards the reality of "Lights-Out-Manufacturing" operation with full traceability conforming to industrial 4.0

The **Auto Paste Replenishment System (Field retrofittable)** can contain 2 cans of 500g solder paste jar to replenish solder paste automatically. It is closed-loop with paste rolling diameter monitoring system to top up the solder paste periodically when the rolling diameter drop below 10mm. This feature will allow more than 8 hours of continuous operation without human intervention.

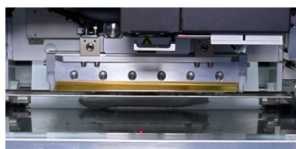


DUAL JAR REPLENISHMENT SYSTEM

AGV Assisted Auto Stencil Change System automatically change stencil trigger by command from the MES server. AGV will transport the new stencil to the rear side of the printer. Upon the completion of the auto paper roller retaining the remaining solder paste on the used stencil, the used stencil will be pushed into the AGV empty slot and replace with a new stencil automatically. Auto paper roller will then swiftly transfer the retained solder paste onto the new stencil to maintain the paste rolling diameter ready for the next production. GKG can also help to integrate this feature onto any existing AGV if customers already had one running at the production floor.



The AGV moves to G-Tera and replaces the used stencil.

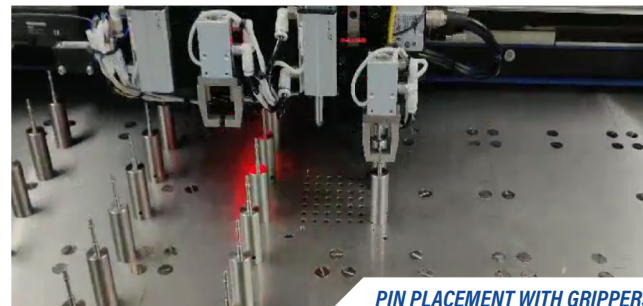


G-Tera starts retaining the solder paste after receiving a signal from the AGV.

MES Software Customization solution is supported by GKG software team to suit the specific interfacing protocol and requirement of the factory's IT communication standard.



The **Auto Support Pin Placement System** utilizes 2 grippers to pick and place the magnetic pins (Max. 60 pieces within 430mm x 510mm area) with pre-program x, y coordinates extracted from the PCB Gerber file. This feature can not co-exist with auto dispensing jetting valve as the grippers are mounted on the same camera X-Y Axis.



PIN PLACEMENT WITH GRIPPERS

SPI Machine Closed-loop Software cater to machines handshake with all major Solder Paste Inspection machines available in the industry.



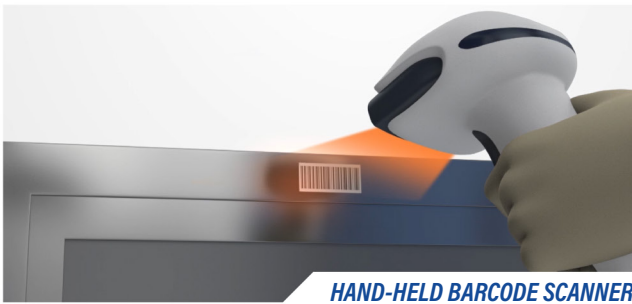
Other optional features available to further enhance the machine capability are as follow:

OTHER OPTIONAL FEATURES

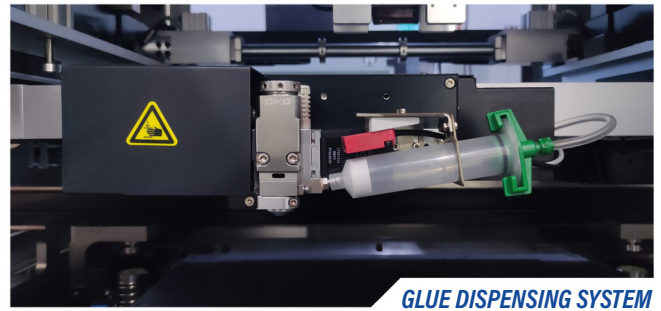
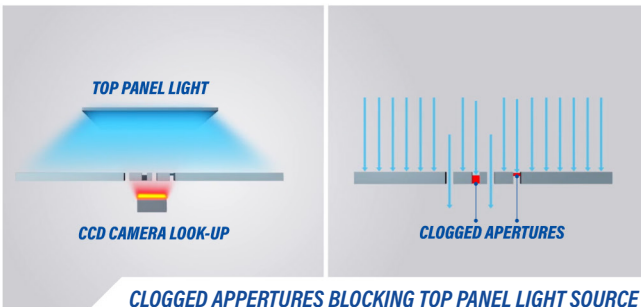
Facial Recognition Authorization System based on facial recognition to provide machine access authority and ergonomically adjust the display height accordingly to each user's specific setting for their best comfort.



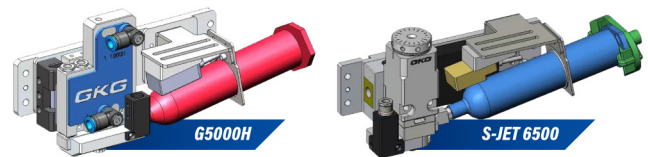
Handheld Barcode Scanner for stencil, squeegee and solder paste verification prior to production.



Stencil Apertures Inspection System with the illumination of the LED lights on top of the stencil, the LIGHT-bolt camera can be programmed to check the stencil apertures prior to production to eliminate bad or clog stencil right from the start or, to inspect those dedicated apertures anytime in between the production to determine the activation of under stencil cleaning cycle.



S-Jet 6500 Pneumatic Jetting Valve a non-contact dispenser (dots & lines) that can jet chip bonder or corner bonder post paste printing to add bonding strength to IC, BGA or connectors.



G5000H Piezoelectric Jetting Valve for dispensing of both glue and paste by non-contact jetting method (dots and lines)

QUIK-TOOL (made in USA) pneumatically operated automatic modular support pin block can be integrated into G-Tera to eliminated manual pin set up for fastest set up especially for double sided PCB printing.



2 machine in series or 2 machine back-to-back cater to single lane or dual lane SMT line to increase productivity.

Camera Scan QR Code scan PCB code prior to printing to record parameters for PCB traceability.

Special 2 Steps Customized Metal Squeegee for miniature apertures printing such mini LED and micro LED (< 150 microns opening)

GKG has the largest printer manufacturing facility in Dongguan City of China, with monthly production capacity of more than 400 printers. For the past 21 years since 2003, we had gathered much knowledge and know how to make reliable and durable printers with the best price-performance ratio and the shortest delivery lead time to meet the high demand of the industry.

GKG Asia Pte Ltd Singapore, the global marketing and training centre since 2009, had in the recent years established branch offices in Malaysia, Vietnam, India and Mexico, with spare parts support and training facilities to serve our distributors and customers better. We are committed to be the leader and your long term partner in this specialize field of solder paste printing technology.



PERFORMANCE

Machine Alignment Capability	#8 μm @ 6 sigma, Cpk ≥ 2.0
Process Alignment Capability	#12.5 μm @ 6 sigma, Cmk ≥ 2.0
Core Cycle Time (excluding printing & cleaning time)	5.2 secs
Actual Cycle Time (including 1 printing & cleaning cycle)	12.5 secs (PCB Size : 200 x 154.5mm, Squeegee speed @ 150mm/s)
Product Changeover Time	2 mins
New Product Set-up Time	4 mins

BOARD HANDLING

Max. Size (L x W)	Single-stage mode : 510mm x 510mm 3-stage mode: 265mm x 510mm (Optional : 400mm x 510mm)
Min. Size (L x W)	50mm x 50mm
Thickness	0.4mm ~ 6mm
PCB Thickness Adjustment	Automatic Height Adjust Platform
PCB Max Weight	5kg
PCB Edge Clearance	2.5mm
PCB Bottom Clearance	20mm
PCB Warpage	Max. 1% diagonally
Clamping Method	Auto Motorized Edge Clamp / Manual Hidden Fixed Top Foil Clamp
Support Method	Magnetic support pins, bars, dedicated vacuum block
Conveyor Belt	U-Shape Belt
Conveyor Direction	L to R, R to L, R to R, L to L (software control)
Conveyor Height	900 \pm 30mm
Conveyor Speed (max.)	1,500 mm/s
Conveyor Width Adjustment	Automatic

PRINTING PARAMETERS

Stencil Frame Size (L x W)	Adjustable, 470mm x 370mm to 737mm x 737mm
Print Gap (snap-off)	0 ~ 20mm
Printing Table Adjustment Range	X: +3mm, Y: +7mm θ : $\pm 2^\circ$
Print Speed	10 ~ 200mm/s
Squeegee Pressure	0.5 ~ 20kg (program control)
Squeegee Type	Std: OPC Squeegee 300mm, 450mm Opt: Stainless Steel Metal Squeegee / 2 Steps Squeegee / Rubber Squeegee
Squeegee Angle	Std: 60°, Option: 45°
Cleaning System	2 in 1 Paperless self cleaning dry & secondary wet lint-free paper with vacuum (software select)

OPTICAL SYSTEM

Camera System	3.0 Megapixel CCD digital camera look up & down concurrently
Field-of-View (FOV)	10mm x 8mm
Fiducial Types	Circle, Triangle, Square, Diamond, Cross
Fiducial Size	0.1mm ~ 6mm
2D Inspection	Max. 500 windows to inspect missing & insufficient (std.)

FACILITIES REQUIREMENT

Power Supply	AC220V $\pm 10\%$, 50 / 60Hz
Power Consumption	2.2kW
Air Supply	4 ~ 6Kgf / cm ²
Air Consumption	5L / min
Dimension (excluding signal tower)	1,258mm (L) x 1,540mm (W) x 1,520mm (H)
Machine Weight	1,250kg

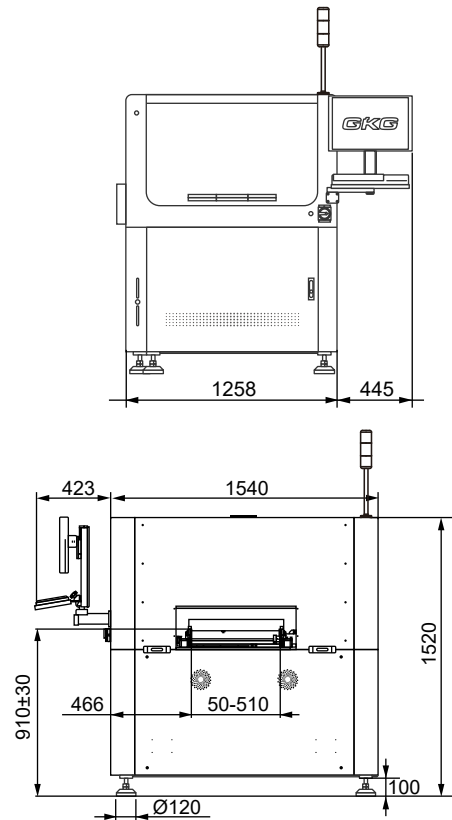
OPERATOR INTERFACE

Hardware	LED Monitor, Mouse & Keyboard
Operating System (OS)	Windows 10
Control Method	Industrial PC controlled
I/O Interface	SMEMA Standard

OPTIONS

Auto Paste Replenishment (Dual jar)
AGV Assisted Auto Stencil Change
AGV Automated Guided Vehicle
MES System Integration (for Ind. 4.0)
Auto Support Pins Placement
SPI closed-loop
Facial Recognition Authorization System
Handheld barcode scanner for stencil, solder paste, squeegee traceability
Stencil Aperture Inspection System
Auto Glue Jetting System (Pneumatic / Piezoelectric)
Quik-tool Pneumatic Support Pin Block (Automatic)
2 machines in series for higher output
Camera Scan QR Code
Special 2-Steps Customized Metal Squeegee (Miniature aperture printing)
External Aircon Unit
3-Stage Conveyor Extension
PCB Dust Remover

EXTERNAL DIMENSION(mm)



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WEBSITE



LINKTREE



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*GKG reserves the right to make any changes concerning design or specification of the machine without any prior notice for continuous improvement. (G-Tera Brochure Version 1.0 2024.10)