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Stencil printers in SMT production

Print quality as a strategic factor for success

A fault-free printing process is the foundation of every effective and reliable SMT production line. Connectivity, automation, quality management and scalability play just as important a role in making an investment decision as do precision, performance and process stability. The DEK TQ printer platform from ASMPT illustrates perfectly what truly matters in today's manufacturing landscape.

Broad production bandwidths, lack of physical space, the persistent shortage of skilled workers and tough quality requirements place enormous demands on the stencil printing process. Increasing component densities, miniaturization and applications such as high-performance computing, AI servers or high-performance 5G and data center infrastructures further exacerbate these requirements. Even the smallest volume deviations or alignment errors can have a serious impact on process stability and yields. As a result, the stencil printing process becomes a strategic quality factor for the entire line, which is why performance improvements involve a lot of optimization work in an area as sensitive as this. ASMPT meets these requirements by employing high-precision linear motors, a new off-belt printing process, innovative clamping systems, advanced print heads with integrated paste height and squeegee pressure controls, and the unique ASMPT NuMotion control system with fiber-optic cabling in its printers.

High precision, small footprint

The performance data speaks for itself: With an alignment accuracy of ±12.5 µm at 2 Cpk and a wet-print accuracy of ±17.0 µm at 2 Cpk, DEK TQ solder paste printers are among the most precise on the market, and these values are measured externally and certified in writing before each machine is delivered.

The DEK TQ L expands the PCB range to a maximum size of 600 × 510 mm, with the printable area extending to 600 × 510 mm. Despite this large size, the maximum core cycle time is only 6.5 seconds. With its smaller printing area, the DEK TQ achieves even 5 seconds.

The conveyor system demonstrates significant progress as well by being able to transport three PCBs (up to 250 mm long in the DEK TQ and up to 300 mm long in the DEK TQ L) in a single cycle. While the PCB is being printed in the middle segment, the printer simultaneously loads the next substrate and ejects the finished one. When longer boards are processed (up to 400 and 600 mm, respectively), the printer automatically switches to its single-stage conveyor mode. And the DEK All Purpose Clamping (APC) system automatically adapts to the board shape and thickness thanks to software-controlled linear actuators.

ASMPT also optimized the machine's floor space productivity, as evidenced in a footprint of only 1.3 × 1.5 meters. Users who need more capacity can employ two DEK TQ printers in a back-to-back configuration in their line, delivering twice the capacity while taking up only slightly more floor space.

The DEK TQ XL expands the portfolio with a model for large-sized circuit boards that accommodates circuit boards measuring up to 850 × 610 × 8 mm (L×W×H) and weighing up to 12 kilograms. It is even capable of printing on the entire surface area. As both PCB dimensions and component densities are increasing significantly, especially in the environment of high-performance computing and AI servers, extremely low error rates are required as reworking complex server boards is hardly economically justifiable. The DEK TQ XL specifically addresses these requirements and expands the range of stencil printing applications into new market segments.

More productivity, fewer operator assists

An important improvement goal with regard to modern stencil printers is to provide relief for the operators, who are already hard to find. One example of ASMPT taking this into account is the high-speed understencil cleaning (USC) system with its own linear actuators. It operates not only up to 50 percent faster than conventional systems but can run for an entire shift without a single operator assist thanks to its 22-meter fabric roll and 7-liter cleaning fluid tank.

The need for manual assists is also reduced by the machines' automatic and flexible support for setting support pins and verifying their position and height. Two pin sizes (with diameters of 4 mm and 12 mm) are kept ready in a magazine holding 30 pins on the DEK TQ and 60 pins on the DEK TQ L.

The paste management has also been simplified considerably. A dual-access cover makes it possible to replace paste cartridges without having to stop the printer, and the new paste transfer unit for the DEK TQ automatically transfers the solder paste during each stencil change, provided the process parameters permit this. This makes the operators' jobs easier and reduces the amount of paste waste by up to 20 percent.

ASMPT has also simplified and streamlined the squeegee changing process. The squeegee, which previously was held in place with two thumbscrews, now gets automatically unlocked when it is moved out of the machine, after which it can be removed in a single step. This speeds up the process by up to 20 percent. Automating functions like these speeds up the return on investment considerably.

With the new DEK TQ GO function, stencil changes can now be fully automated, if desired. Autonomous transport systems move and change the stencils while seamlessly integrating themselves into the automated material flows in the intelligent factory. When combined with software-supported intralogistics solutions, this makes it possible to reduce manual assists and reduce line downtimes significantly.

Automatic offset correction

The quality of the solder paste printing process is also influenced by various external factors, which is why it must be constantly monitored and readjusted. The Process Lens SPI system and the WORKS Optimization application from ASMPT make it easy to create a closed quality control loop that continuously evaluates printing and inspection data, optimizes process parameters and triggers cleaning cycles as needed.

The solder paste printing process thus has a direct impact on the line's availability, its yield, and the process stability of the entire SMT production. A reproducible, self-regulating process reduces downtimes, minimizes manual assists, and sets the stage for a continuously automated production.

Automated Program Change

ASMPT's Automated Program Change is another contributor to automating the entire SMT line. Since the machines on the SMT line are intelligently connected with each other via the IPC-HERMES-9852 standard, a product change causes the matching production program or recipe to be downloaded station by station. The new product information is captured at the start of the line, which is normally the PCB loader. When each machine detects a recipe change, the Automated Program Change springs into action, and the stencil printer if no exception. As the data transfer continues from machine to machine, no manual program changes are needed anymore. Even the conveyors communicate over the standardized interface and adjust their widths to match the respective PCB. This works not only with family setups but with all setup configurations.

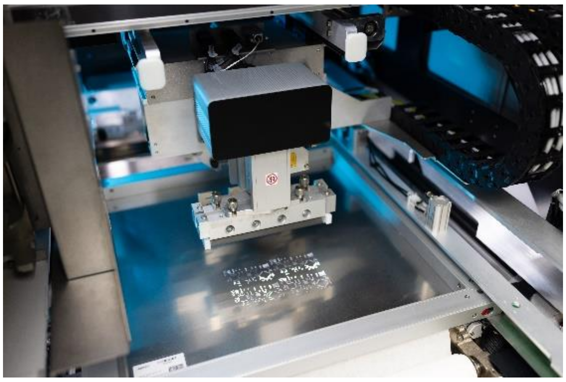
Standardized interfaces

With M2M networking standards such as IPC-HERMES-9852 or IPC-CFX, the DEK TQ printing platform fits perfectly into ASMPT's intelligent factory concept, which achieves a higher level of quality, more process stability and smoother material flows while relieving the burden on the employees through the integrative use of data. And thanks to the open interface architecture, major efficiency-enhancing functions like the automatic offset correction or the Automated Program Change work even with equipment from other manufacturers.

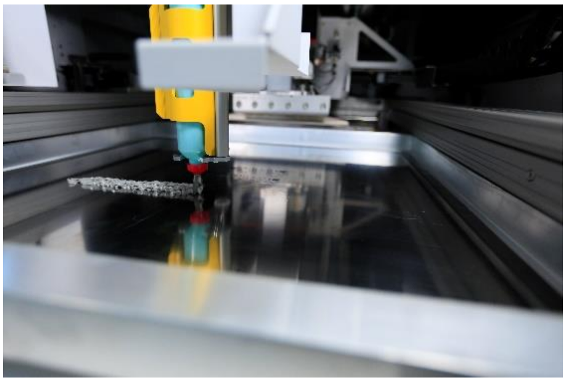
Reference class in modern solder paste printing

The stencil printers of the DEK TQ platform clearly demonstrate what makes sense and is state-of-the-art today. With its three models DEK TQ, DEK TQ L and DEK TQ XL, their manufacturer addresses the total range of today's production requirements. Anyone planning to reconfigure or expand their production should use this product line as a guide when choosing a stencil printer.

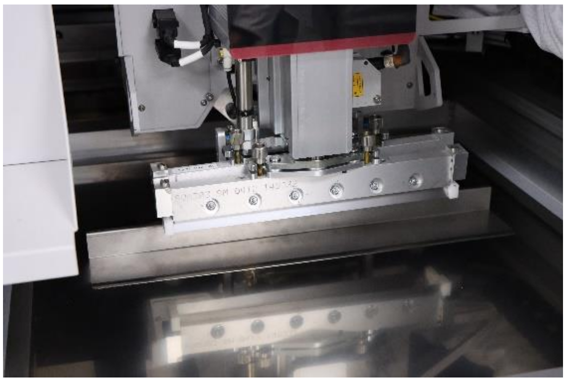
DEK TQ, DEK TQ L and DEK TQ XL: The universal printing platform from ASMPT covers the complete spectrum of modern electronics production.
(Image credit: ASMPT)



Positioning the stencil, which is held in place with low tension, with a high degree of alignment precision creates the prerequisites for stable paste volumes and a stable printing process.
(Image credit: ASMPT)

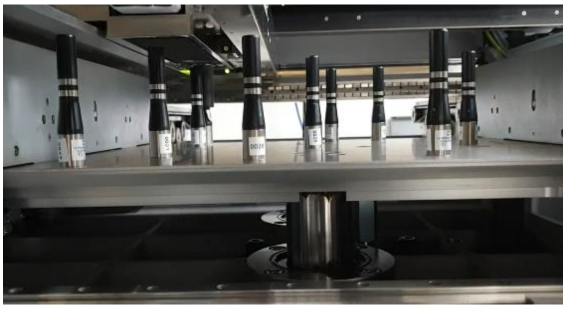


The precise application of solder paste on the stencil is critical for stable volumes and minimal tolerances in the subsequent placement process.
(Image credit: ASMPT)



During a stencil change, the remaining solder paste is automatically transferred to the new stencil.
(Image credit: ASMPT)

When the squeegee is removed from the machine, its is automatically unlocked so that it can be switched out in a single step before the mount automatically locks the new squeegee in place when it is retracted into the machine.
(Image credit: ASMPT)



The support pins placed via software commands compensate for PCB distortions and ensure reproducible print quality even with complex layouts.
(Image credit: ASMPT)

By making it possible to hot-switch solder paste cartridges, the dual-access cover contributes to more system availability and reduced setup times.
(Image credit: ASMPT)

High-speed understencil cleaning (USC) with separate linear actuators: Up to 50 percent faster than conventional systems and able to run for a complete shift thanks to a 22-meter fabric roll.
(Image credit: ASMPT)

By reliably supplying the high-speed understencil cleaning system with cleaning fluid for a complete shift, the integrated 7-liter tank increases the printer’s availability considerably.
(Image credit: ASMPT)