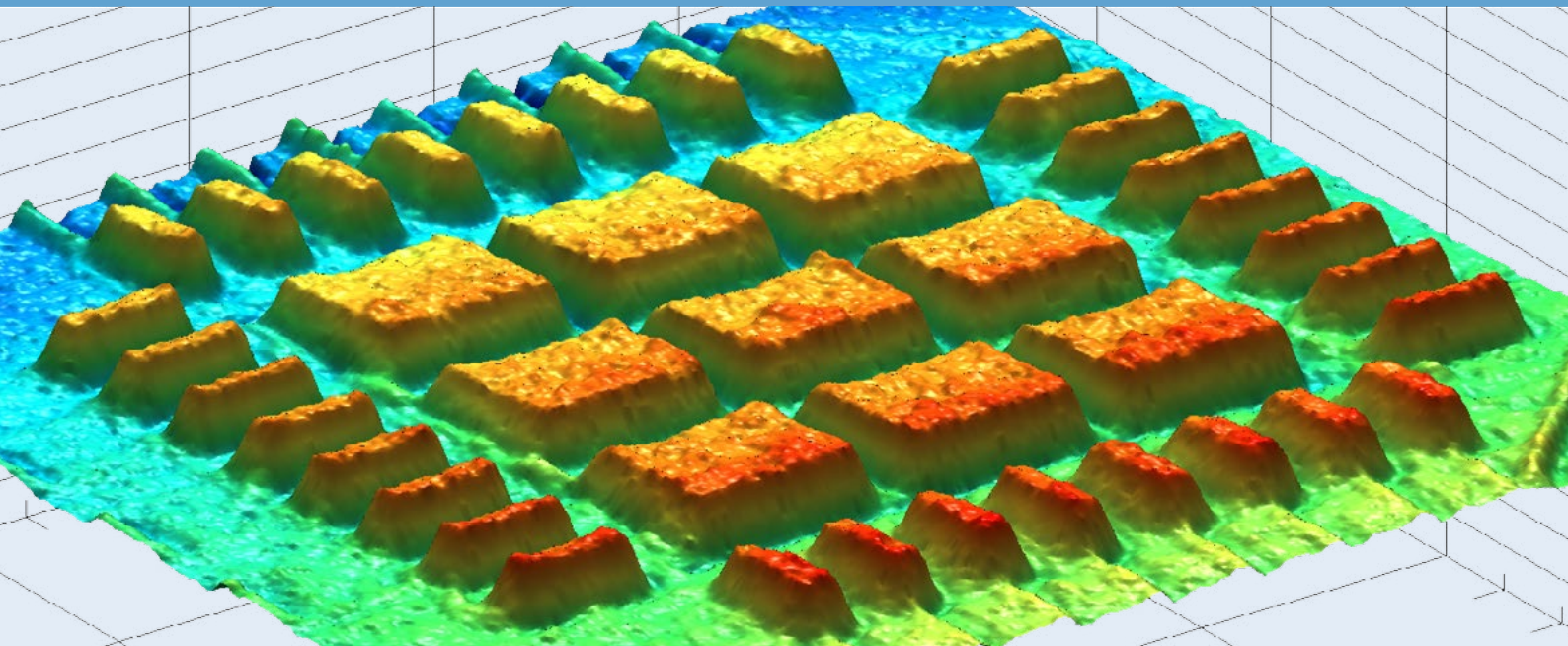# Ersa VERSAPRINT
## Printer Platform with integrated
## SPI-System – available also in 3D





kurtz ersa

## VERSAPRINT
### Unique Printer Platform with fully integrated inspection – partial, 100 % 2D or 100 % 3D


*VERSAPRINT P1*

### ∿ ersa  VERSAPRINT P1

The highlight of the VERSAPRINT series, the P1, is designed for speed. Featuring the parallel process of print and inspection the P1 reaches nearly the cycle time of independent systems with the obvious advantage of only one software structure, hardware and less floor space.


*VERSAPRINT S1*

### ∿ ersa  VERSAPRINT S1

The S1 is the best seller of the VERSAPRINT series. With a minimum line length this printer is best for small and medium range production and the perfect match between function and cycle time.


*VERSAPRINT B1*

### ∿ ersa  VERSAPRINT B1

The VERSAPRINT B1 is the ideal printer for manufacturers that don´t need 100 % integrated inspection or have already a SPI system installed after the printer. This flexible and future orientated system can be retrofitted with 2D or 3D SPI anytime.

It´s been a while that the stencil printer as one of the key processes of the SMT line is not only being used as a printer. A wealth of optionally available features has generated out of a simple printer a multi functional machine. Especially the inspection after the print process will be at an increasing rate indispensable.

At the beginning of the SMT era, a printer was only equipped with a camera to align substrates and a stencil cleaner. In fact the stencil cleaner had no vacuum cleaning function at this time, only wet and dry. Meanwhile the printer has taken over a lot of jobs, starting with setup control during change over, up to complete tracing of all process data. Even a dispenser option to apply glue or additional paste onto the substrate, for example for heavy components, is available.

More than 20 years ago the stencil printing replaced the screen printing process because of the surface mount technology. Motivated through the increasing miniaturization of SMT components the resolution of the screen was not able to fulfill the requirements anymore.

Metal stencils captured the market. At the same time the need for a post print inspection was getting clear and  the 2D inspection era started.

At this time the degree of miniaturization was small and a partial inspection of a few fine pitch components was sufficient to give a reliable judgement about the print quality. To perform the inspection the integrated field-of-view cameras were used. Over time these cameras were improved with larger inspection areas. Nevertheless, these cameras were never able to inspect the complex PCBs 100 %. Under these circumstances and the continuously rising inspection needs, separate inspection systems were developed and entered the marked. Parallel to 2D, the 3D inspection always was a topic. Where the 2D inspection was

only able to give a statement about the print area, the request for more and more information became ever higher and so the wish for a third dimension tremendous.

The first systems failed. On the one hand the technology for the height measurement didn´t exist and on the other hand the processing power was simply not enough. These issues were solved during the last 10 years and the successful market launch of the 3D inspection, known as solder paste inspection – SPI took place.
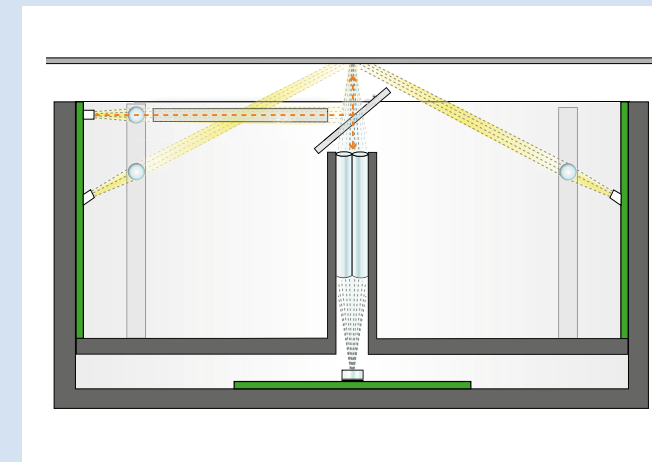
# VERSAPRINT 2D
## The first stencil printers worldwide with fully integrated 100 % SPI



MLF32
P=0.65
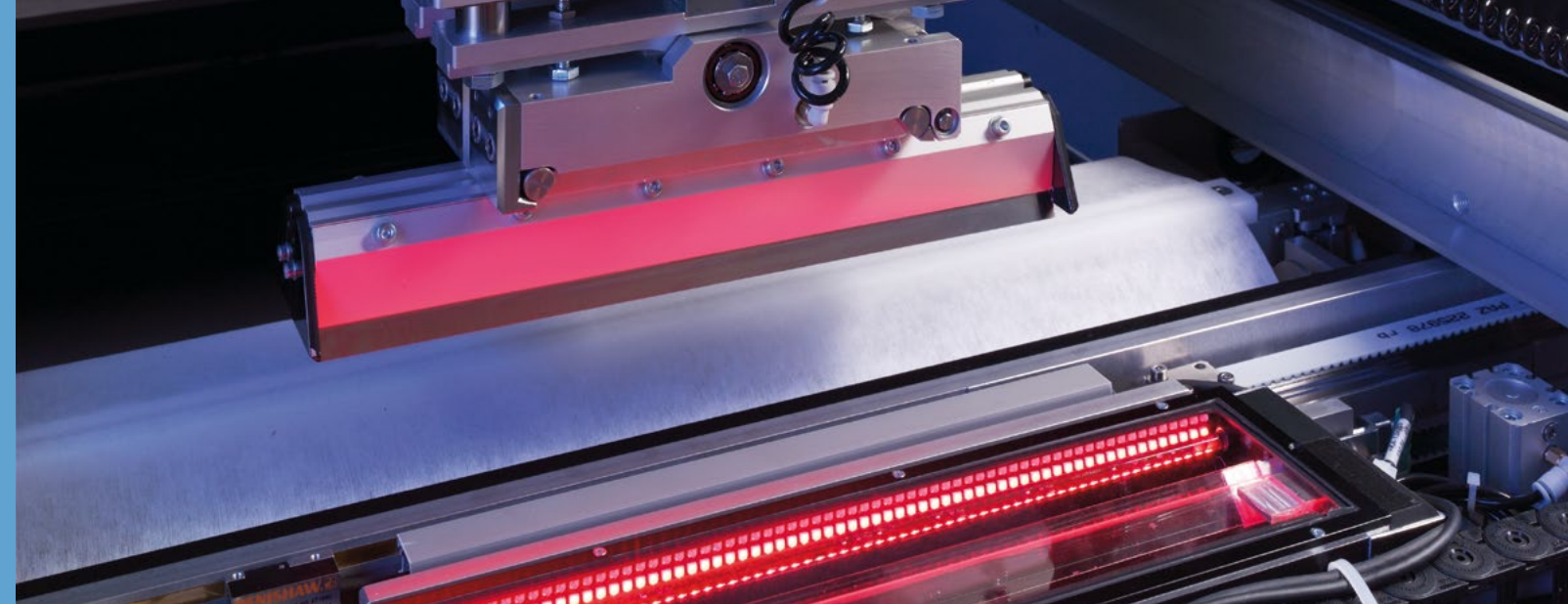
*direct light source*

MLF32
P=0.65

*diffuse light source*

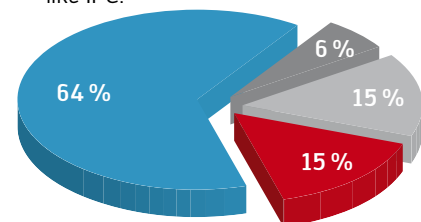*schematic of the LIST camera*

## Unique advantages

- True parallel process for print and inspection
- LIST-camera for 100 % Inspection at line speed
- Less floor space for print and inspection
- Closed-loop-process control for print and SPI
- Easy to setup and operate
- Printer and SPI in one

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### VERSAPRINT S1-2D / P1-2D

Almost 70 % of all process defects in a SMT-Line are related to the printing process.

Due to this fact it is mandatory to install an inspection system after the print process. The 2D inspection is a well known variation of the SPI and for most of the applications excellent suitable and easy to setup and operate. Even less qualified operators and supervisors are able to determine the process limits with the help of guidelines and directives like IPC.

Ersa with their integrated 2D inspection is currently the only manufacturer on the market who is able to perform a 100 % inspection in line speed.

The revolutionary **Line Scan Technology (LIST)** camera is the heart of the integrated inspection. With its length of 260 mm and a scanning speed of 70 mm/s it inspects paste on pad. At 35 mm/s it also inspects the print for bridges. On a **VERSAPRINT S1** the process steps are printing and then inspecting afterwards. On a **VERSAPRINT P1** Ersa has decided to strike a new path. A combination of a triple section transport and a special layout of the camera gantry enables the

system to perform the two most time consuming processes, print and inspection, at the same time. It is depending on the line speed to decide which machine is suitable best.

The as well integrated stencil inspection detects smearing and clogging and expand the process window as it will initialize a stencil cleaning cycle to prevent a possible miss print.

Another feature of the integrated inspection is the print offset inspection. It will detect a possible print offset after the print and is able to compensate it for the next PCB, certainly print direction depending.



6 %

64 %

15 %

15 %

*Error distribution in SMD-Process – C. H. Mangin*

■ *Paste print*  ■ *Reflow*  ■ *Pick & Place*  ■ *Other*

*VERSAPRINT P1-2D*

*VERSAPRINT B1*

### VERSAPRINT B1

The **VERSAPRINT B1** is the ideal printer to enter line production and when 100 % inspection is not requested. The printer is perfectly suitable for customers expecting a perfect print result in combination with an easy to use printing system. The printer is equipped with an area camera that uses two separate camera modules.

Both modules have two illumination techniques: direct and diffuse illumination, thus qualifying them to recognize even the most complicated structures on the substrate.

Combining the **VERSAPRINT B1** with an SPI system enables the closed loop function that feeds back the inspection result to the printer which could be used for optimizing the printing process.

Certainly the printer can be equipped with the optional available partial 2D inspection to verify the position, quality and the risk of shorts for glue or solder paste printing.
On the stencil the apertures and under stencil smearing will be inspected. The system can be retrofitted with 2D or 3D-SPI.

# VERSAPRINT 3D
## The first stencil printers worldwide with fully integrated 100 % 3D SPI
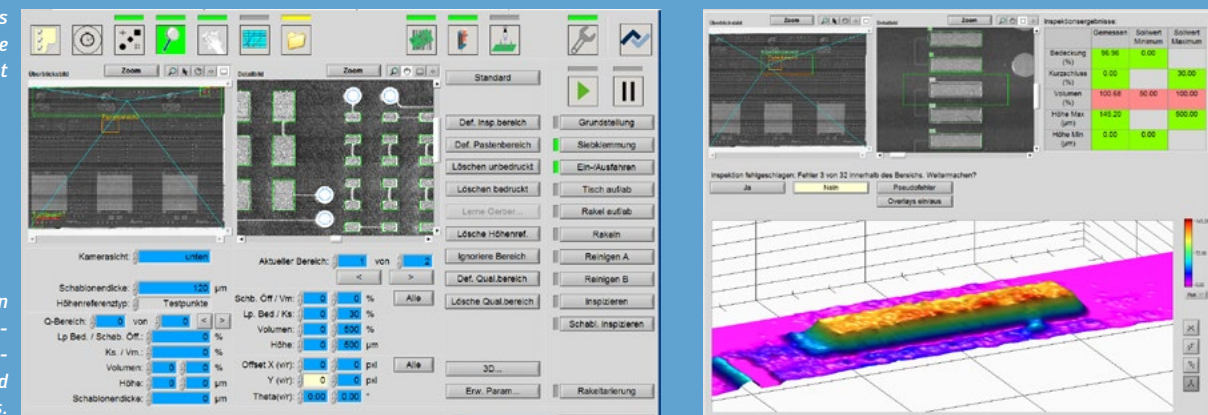
## VERSAPRINT 3D SPI advantages vs. 3D SPI stand-alone systems:

■ 3D-SPI for the inspection of complex PCBs direct after the printing process
■ Versaprint stencil inspection detects errors before they appear
■ Zero reference measurement of the unprinted PCB can be done before every print
■ Integrated closed loop function for print offset compensation
■ One software platform for print and inspection – one consistent operator concept
■ Maintenance and service for only one machine
■ One contact for both processes
■ Less space required on the shop floor
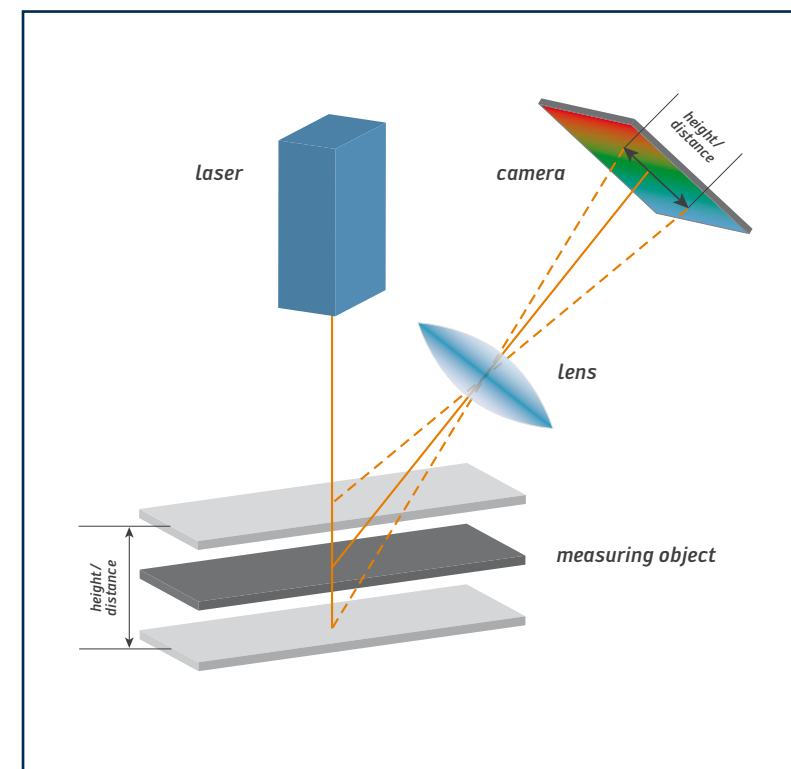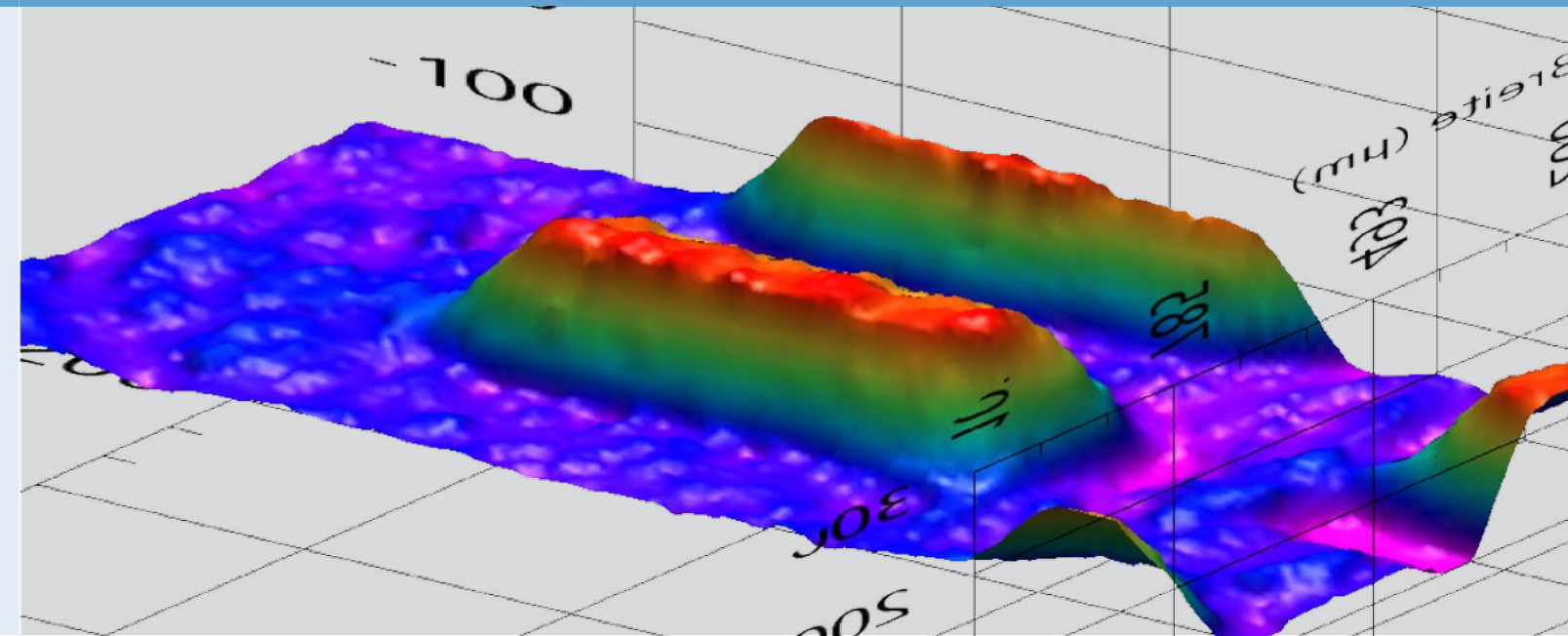


### Laser triangulation

The implemented procedure for the 3D inspection is the laser triangulation concept. The laser triangulation projects a laser beam onto the object to be measured. The reflected beam will be imaged under the triangulation angle onto the camera chip and out of the optical structure the height information is calculated. The picture is made while scanning over the PCB and captures the laser profile.
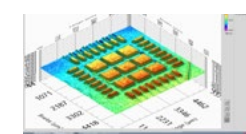


*laser*  *camera*  *height/distance*  *lens*  *measuring object*  *height/distance*



*VERSAPRINT S1 3D*
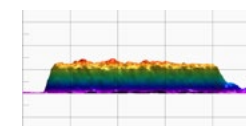

*Profile of the inspection result incl. height indication*
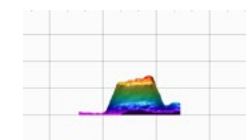

*Profile of the inspection result incl. height indication – rotated by 90°*


*Inspection result*

### Requirements for the inspection

For the 3D inspection the following characteristics are important: Volume, area, height, bridging and offset. The inspection will be performed using the laser triangulation only. In case of an detected error a 2D picture can be done to allow the operator to make a better analyses. The 3D picture can be rotated to give the operator a 360° view of the possible defect print. Height informations are colored while the outside limits are orange and red. The simultaneous 2D stencil inspection gives the opportunity to perform an automatic stencil cleaning cycle in case of a defect like clogging or smearing. Another advantage of the integrated inspection is the closed loop function for the print offset detection. An existing print offset will be detected and print direction depended adjusted.

### Zero point determination

A common technique is to measure an unprinted PCB as a reference for the whole production charge. In this case the height of an unprinted pad will be calculated in relation to the surrounded solder mask. This procedure has to be repeated for a new PCB lot or when changing the supplier. The advantage for a integrated inspection inside the printer is clear: every PCB can be inspected before the print take place. This can be done for a number of boards and then switched off or in case of very sensible boards, repeated every time. Another solution for the pad zero level determination is the use of local fiducials or test points on the board. These marks are usually all over the board and their height are on pad level. This feature has a cru-

cial advantage, the variation of the solder mask is not relevant and a pre inspection is no longer required.

### SPC data analysis

SPC-data logging and analysis is an important tool to optimize the production process. For all relevant data of the inspection a trend analysis is made. This enables the customer to qualify over a number of batches or production shifts e.g. a stencil or solder paste. The inspection result can be stored as a picture, defect or not. A qualification and analysis is possible every time afterwards. The result of the SPC analysis can be used at the printer to immediately optimize the process, at the end of the production line in combination with the AOI system or as a control tool for the production manager.

# VERSAPRINT
## Standard Features
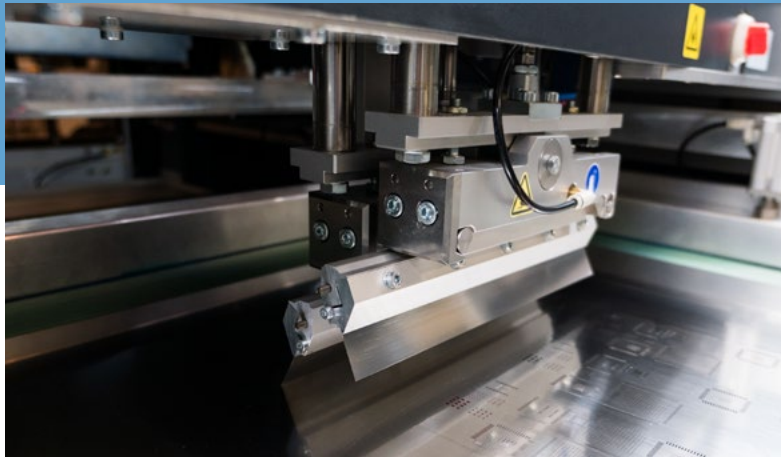


### Print head and squeegee

- Closed pressure system for repeatable print result
- Weight compensation of squeegee and print head enables even very small pressure
- Easy mounting and pneumatic clamping of the squeegee
- Screen print head optional available
- All common squeegees types can be used
- Squeegee angle is mechanical fixed to eliminate operator influence



### Substrate handling and parallel process

- Substrate is clamped between over top clamping and transport belt
- Thin substrates are clamped without warping
- Precise pressure adjustment for side clamping using the track width motor prevents warping of even very thin boards
- Minimum snap off and overlap of the substrate edge
- Triple section transport at the Versaprint P1 combines the two most time consuming processes, printing and inspection and therefor reduces the cycle time



*VERSAPRINT P1*

# VERSAPRINT
## The first stencil printers worldwide with fully integrated 100 % SPI
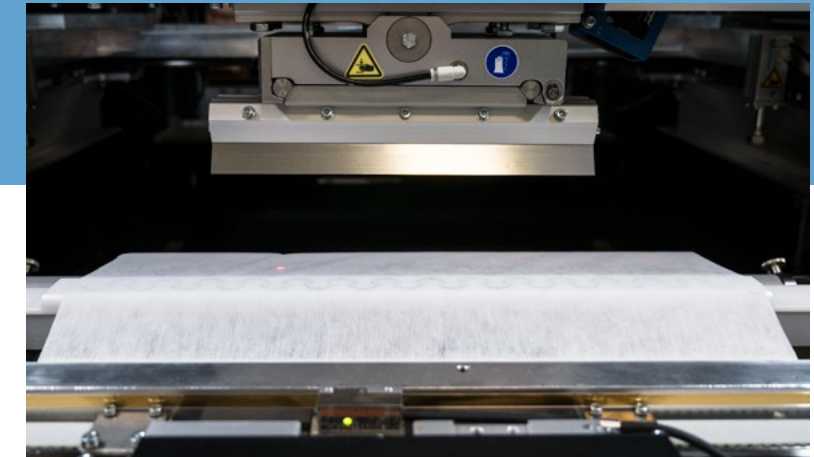


### Stencil cleaner

- Cleaning system with wet, dry and vacuum cleaning mode
- Under stencil cleaning system with speed controlled paper feed for repeatable cleaning cycles
- Dispenser for exact and precise amount of cleaning solvent
- Intelligent stencil cleaner – a cleaning cycle will be automatically performed after a bad stencil inspection
- An easy concept of the cleaning unit enables a fast change over of the cleaning paper without the need of extra tools
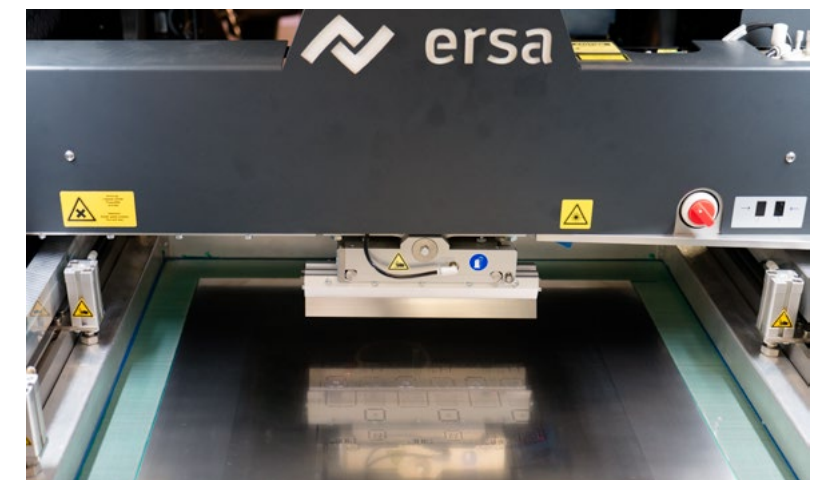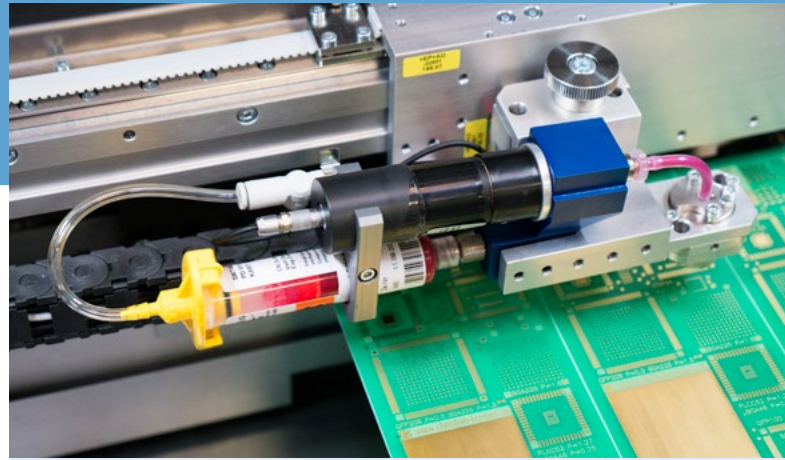


### Stencil mounting and setup

- All stencil formats and flexible stencil systems can be used
- Flexible stencil mount for different stencil sizes
- The stencil is fixed, nescessary for 3D stencils
- Mechanical stopper at the print head for easy stencil mounting – parameter saved with the product file

# VERSAPRINT
## Highlight Options



### Dispenser – auger screw or jet

- Screw dispenser for SMD glue or solder paste
- Dispensing of additional paste, e.g. for components with a higher demand of paste
- Glue dispensing to fix heavy or position critical components
- Jet Dispenser for more flexibility and speed
- Optional heating unit available for temperature critical material
- Inspection of dispensed dots if 2D or 3D inspection is available
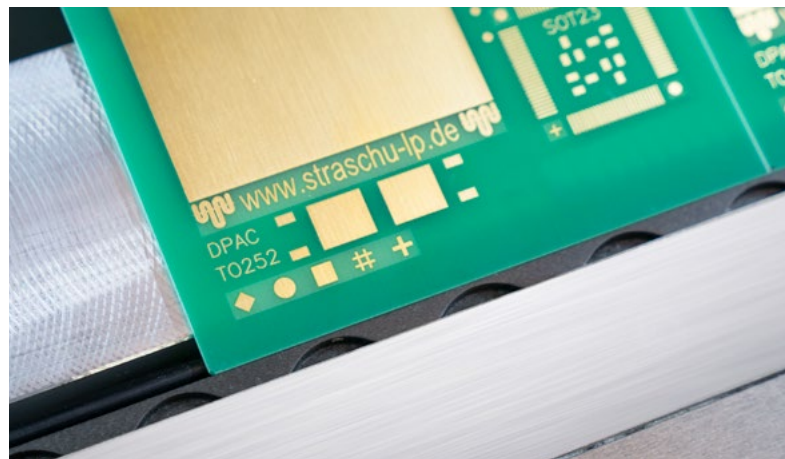


### Retractable over-top clamping

- Perfect solution to print till the edge of the board
- No snap off between stencil and board
- Precise pressure adjustment for side clamping using the track width motor prevents warping of very thin boards
- Height fixation of the side clamping garanties stencil support outside the print area

# VERSAPRINT
## The first stencil printers worldwide with fully integrated 100 % SPI



*VERSAPRINT P1*
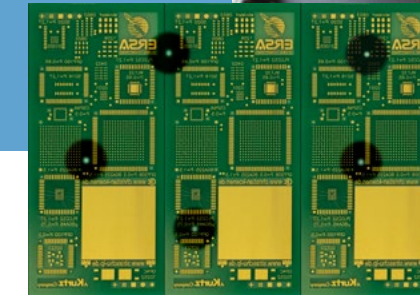
### Camera guided Pin-Positioning

- Camera guided positioning of PCB support pins
- Perfect for boards that not allow to support under components
- Prevents to position support pins under the pin-in-paste opening
- Marking the position of the pin during setup will guide the operator to position the pin
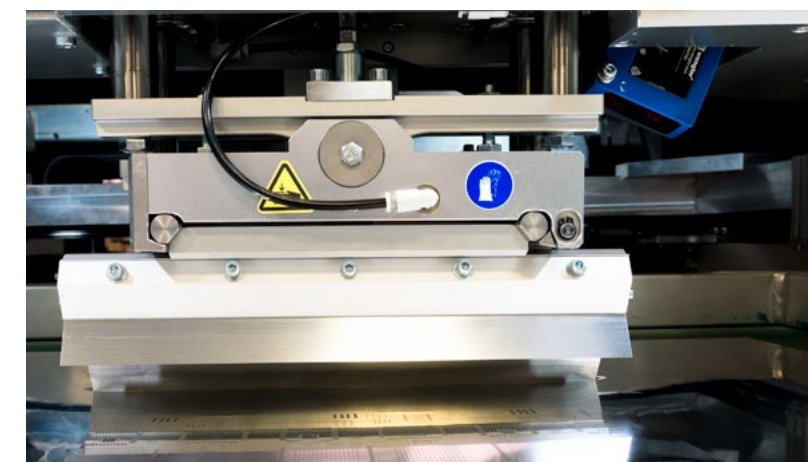


### Additional options

- Paste height control
- Dispenser for print material
- Temperature and humidity sensor
- Climate control inside the printer
- Setup control and DMC
- Closed loop to SPI
- Flexible substrate support systems

# Technical data

|  | VERSAPRINT P1 | VERSAPRINT S1/B1 |
|---|---|---|
| **Substrate handling** | | |
| Maximum Substrate size Vision (X x Y) | 460 x 460 mm | 550 x 500 mm |
| Maximum Substrate size Vision (X x Y) parallel process | 420 x 460 mm | |
| Maximum Substrate size Printing (X x Y) | 500 x 460 mm a dedicated workholder is required for substrates with an X size larger than 420 mm | 680 x 500 mm a dedicated workholder is required for substrates with an X size larger than 550 mm |
| Minimum Substrate size (X x Y) | 80 x 50 mm | |
| Substrate thickness | 0,4 – 6 mm over-top-removable clamping: min 0.8 mm | |
| Maximum Substrate weight | 1.5 kg | |
| Component clearance | 0 – 30 mm | |
| Transport clearance | 3 mm | |
| Transport height | 840 – 965 mm | |

| **Print parameters** | | |
|---|---|---|
| Print speed | 10 – 180 mm/s | |
| Print force | 0 – 200 N | |
| Seperation speed | 0.2 – 55 mm/s | |
| Print mode | print/print – flood/print | |
| Paste knead | programmable | |

| **Stencil mounting** | | |
|---|---|---|
| Maximum Stencil size | 750 x 750mm | |
| Minimum Stencil size | 450 x 450 mm | |

| **Performance** | | |
|---|---|---|
| Repeatability | ± 12.5 µm @ 6 Sigma | ± 12.5 µm @ 6 Sigma |
| Print accuracy | ± 25 µm @ 6 Sigma | ± 25 µm @ 6 Sigma |
| Cycle time | 10 s + print | 10 s + print for the B1, 14 s + print for the S1 |

| **Vision** | | |
|---|---|---|
| Fiducial size | 0.1 – 3 mm | |
| Fiducial types | all synthetic fiducials or any unique shape | |

|  |  | VERSAPRINT B1 |
|---|---|---|
| **Vision** | | |
| Area camera FOV (Field of View) | | 10.5 x 8 mm |
| Inspection speed | | 1 picture/s |

|  | VERSAPRINT P1-2D | VERSAPRINT S1-2D |
|---|---|---|
| **Specification 2D** | | |
| Camera | Line scan camera | |
| Camera size | 260 mm line length | |
| Inspection speed | 70 mm/s for paste on Pad only, 35 mm/s for paste on pad and bridge detection | |

|  | VERSAPRINT P1-3D | VERSAPRINT S1-3D |
|---|---|---|
| **Specification 3D** | | |
| Camera | Camera for fiducial recognition and 3D SPI | |
| Inspection speed | 140 mm/s at 34 mm width | |
| Resolution | X and Y: 17 µm, Z: 1 µm | |
| 3D method | laser triangulation | |

| **Machine dimensions** | | |
|---|---|---|
| Width x Depth x Height | 1,760 x 1,850 x 1,600 mm | 1,190 x 1,850 x 1,600 mm |
| Weight max. | 1,340 kg | 1,140 kg |

| **Service** | | |
|---|---|---|
| Power supply | 3 x 230/400 V ±10%, 3L/N/PE at 50/60 Hz, 16A | |
| Air supply | 5 – 10 bar, 5 l/min; 5.5 l/sec in vacuum cleaning mode | |

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