Samsung Techwin presents the new next-generation component placer platform – the SM400 series. The SM400 series machines offer the world’s highest part placement capability among those of the same class by evolving the highly successful SM series machines.

From microchips for mobile devices to large boards for display, SM400 series machines provide optimum placement solutions to various needs of customers through the super high-speed On-The-Fly part placement mechanism and the vision system with high accuracy, yield, and reliability. In addition, the series of component placers are provided with identical hardware and software to maximize productivity and the new ergonomic design maximizes customer satisfaction.
The new SM400 series component placer provides optimum solutions to customers who desire to produce high-quality products from mobile devices of high speed/high precision and DSC products to large display products. It is the next generation mounter platform from component placer by enhancing the modularity and performance of existing SM series machines in order to actively respond to various market requirements for changes.

**New Smart Platform**

**SM400 Series**

**Simple & Easy**
- Intuitive operating environment through ergonomics analysis
- Smart system architecture for ease of maintenance and maximum stability
- Easy set-up identification through application of color coded clamping for feeder

**Modularity & Availability**
- Convenient inline operation through unification of main modules and inline platform
- Rapid job change through reinforced networked Parts Library (Vista)
- Reinforced applicability to parts through reinforcement of multi-pixel camera and parts registration algorithm
- Maximum PCB size among machines of the same class

**Reliability & Throughput**
- Robust ball screw drive overhead gantry design
- True On-The-Fly vision processing of all components
- Unique conveyor designs to maximize board handling efficiency

The new SM400 series component placer provides optimum solutions to customers who desire to produce high-quality products from mobile devices of high speed/high precision and DSC products to large display products. It is the next generation mounter platform from component placer by enhancing the modularity and performance of existing SM series machines in order to actively respond to various market requirements for changes.
**Reliability & Throughput**

Realization of the highest throughput among machines of the same class

The SM400 series machines realized the highest placement performance with two gantries by adopting the twin servo mechanism to the Y axis and flying vision to minimize the moving speed of the head for part placement.

**Part Placement through Nonstop On-The-Fly Recognition**

The unique On-The-Fly image recognition technology of Samsung Techwin allows part recognition without stopping after part pickup, minimizing the time of movement between pickup position and placement position and maximizing the placement speed by zeroing the recognition time.

- **Placement Speed:** 42,000 CPH (IPC9850), 55,000 CPH (Optimal Condition)

**High Speed X-Y Driving Mechanism**

The twin servo system applied to each axis of the gantry structure allows high speed placement by strong accelerating force.

- Equipped with self-motion controller
- Reinforced rigidity of driving system
- Implementation of high acceleration and low vibration
- Reduced setting time
- Reinforced absolute accuracy and repetition accuracy

**Placement Accuracy Calibration System**

The newly upgraded placement accuracy calibration system automatically checks and calibrates the pickup point offset, head offset, C/V offset, etc., to allow reliable part placement.

**Zeroing of PCB Loading Time**

By adopting a dual work conveyor and shuttle inlet conveyor of first-in-first-out type, the PCB loading time was minimized and gantry efficiency is maximized due to elimination of a common work area, thus maximizing the actual productivity. Each gantry can work at full speed independently without risk of interrupting the opposing gantry. In addition, it supports various placement modes according to production characteristics and board size.

**Modularity & Availability**

Reinforced Modularity — Providing Optimal Solution

SM400 series machines are high scalability and allow easy optimization according to production type by unifying the operating system of hardware and software so that reconfiguration of lines and program portability are easily accomplished. Therefore, solutions can be quickly provided.

- **Reinforced Part Library Support and Quick Part Registration**
  - It has an enhanced part registration library to allow quick part registration as well as stable part recognition and placement, and supports the polygon recognition related to unregistered part to allow the parts of complicated shape to be registered easily.

- **Applicability to Long & Large PCBs among Those of Same Class**
  - The SM Series dual-lane conveyor system accommodates PCBs up to 250mm, increasing the overall placement speed. The system can also accommodate PCBs up to 460mm on a single-lane conveyor.

**Productivity per Unit Area**

The highest productivity compared to the area of machine : 26,700 CPH/m²

**Standard SM411**

- Dual Lane(mm) L50 x W40 ~ L460 x W250
- L50 x W40 ~ L510 x W460

**Optional Options**

- Reinforced Component Applicability by the Support of Mega Pixel Camera
  - The mega pixel camera allows the placement of parts from 0603(01005) micro chips. The SM400 series machine also allows recognition of larger parts with fine pitch or balls using 45mm camera such as 42mm with 0.4mm pitch by adopting a mega pixel vision system for the Stage camera.

From micro chips for mobile devices to large boards for display - SM400 series machines provide optimum placement solutions to various needs of customers through the super high-speed On-The-Fly placement mechanism and the vision system with high reliability.
Simple & Easy

Adoption of New Ergonomic Design

The operation environment of the SM400 series machines has been developed through careful consideration of the user-oriented environment after ergonomic analysis. The high efficiency of operation space has been achieved through unification of the size of chip shooter and the odd-shaped machine to maintain perfect straightness for inline configuration.

User Convenience – Position of Monitor and Operation Panel

The height of the machine was lowered through ergonomic redesign and the operation panel and keyboard position were optimized for convenient operation.

User Friendly Feeder Design

- Easy Feeder Identification
- Easy Differentiation of Feeder State

Maintenance Convenience – Utility Position Improvement

All utility connections are installed inside the machine to provide a clean and safe environment.

Location of Grease Injection Nipple

For the grease injection that is periodically performed during maintenance, the position of the nipple was considered for convenient grease injection.

Dual Operating Consoles

Two operating consoles allow access to system controls from both the front and rear sides of the machine.

New Smart Platform

From micro chips for mobile devices to large boards for display - SM400 series machines provide optimum placement solutions to various needs of customers through the super-high-speed On-The-Fly placement mechanism and the vision system with high reliability.

SMD Configuration Diagram

Magazine Loader

Transfers PCBs loaded onto the magazine rack to the next process machine using the pusher.

Vacuum Loader

 Picks up a bare PCB by vacuum and transfers it to the next process line. It can be configured into the line with the magazine loader.

Inverter

Reverses PCB by 180° to perform work on both sides.

Screen Printer

Places various electronic parts (chip, IC, etc.) on the PCB surface on which solder cream is printed.

Chip Mounter

Applies solder cream (lead included bonding agent) by stencil printing method at the area on the PCB surface to which electronic parts are to be placed.

Work Station

Provides space for visual inspection of the part placement status.

Reflow

Performs soldering and hardening of a PCB at an appropriate temperature on which electronic parts are placed.

Shuttle Gate Conveyor

Provides an intermediate path in the line in order to minimize the moving line of the operator.

Vision Inspection System

Checks the quality of printing, part placement and soldering in the SMD line. It is divided into a print inspection device, placement inspection device and soldering inspection device.

Shuttle Dual Unloader

As dual type machines, they check whether PCBs transferred to the unloader after quality inspection are defective, and will load only non-defective PCBs.

New Smart Platform
Compact High Speed Chip Shooter

SM431

The SM431 is a high speed chip shooter with 2 gantries and 16 heads. It achieves high productivity while requiring a minimum amount of floor space. The high speed chip shooter is the best in its class requiring 25% less installation room while productivity per footprint is increased by up to 40% when compared with the SM411. In addition, it adopts a new flying vision system that reduces head weight and improves reliability for the optimization of high speed part placement. The SM431 can place a variety of different chips, from the basic 0402mm chip up to 12 mm IC parts, and can handle PCB's up to L460 x W460mm.

Features
- Placement Speed: Chip 42K CPH (IPC9850)
- Applicable Parts: Max. 0402 ~ 12mm (Part height H=7mm)
- Placement Accuracy: ±0.05 mm/Chip
- Maximum PCB size: L330 x W250 x 2Lane (Standard) / Max. L460 x W460 x 1Lane
- External Dimension: 1,240mm(L) x 1,660mm(D) x 1,420mm(H)

New Head
- 8 Spindles 15mm Pitch
- New Flying Vision System

Greatly maximizes productivity per square meter.
- 55,000 CPH (Optimum Condition)
- Productivity has been increased by more than 40% when compared with the SM411
- Floor space/footprint has been reduced by 25%

Join Mode: Common use of front and rear feeders (less than 250mm lengthwise).
Single Mode: For production of medium and large sized board (greater than 250mm lengthwise).
Twin Mode: Individual placement on front and rear sides (less than 250mm lengthwise).
Even if one placement head has a problem or parts have run short on one side of the board, the part placement can be done by another head, allowing continuous production without stopping the machine.
Normal Mode: PCB Double Side Simultaneous Production Mode

New Smart Platform

From micro chips for mobile devices to large boards for display - SM400 series machines provide optimum placement solutions to various needs of customers through the super-high speed On-The-Fly placement mechanism and the vision system with high reliability.
**Dynamic Chip Shooter SM411**

The SM411 has achieved the highest placement speed of 42,000 CPH for chips and 30,000 CPH for SOP parts based on IPC, respectively, in the world among machines of the same class by adopting a dual gantry mechanism and On-The-Fly method, for which Samsung registered patents. In addition, by implementing high accuracy placement of 50 microns at high speed, it allows placement of parts from the smallest 0402 chip to 14mm IC part. In the aspect of IPC applicability, it allows simultaneous feeding of 2 L610 x W460 PCBs, increasing actual productivity. It also supports the production of L610mm long board for display as an option.

**Features**
- Placement Speed: Chip 42K CPH (IPC9850) / SOP 30K CPH (IPC9850)
- Applicable Parts: Max. 0402 ~ 1440 x H=12mm
- Placement Accuracy: ±50 μm(Max) ±3Sppm
- Applicable PCBs: L610 x W460 x 1lane (Standard) / L510 x W460 x 1lane

**Providing Support of Various Placement Modes According to Production Characteristics**
- Twin Mode: Common use of front and rear feeders (less than 250mm lengthwise).
- Single Mode: For production of medium and large sized board (Greater than 250mm lengthwise).
- Twin Mode: Individual placement on front and rear sides (less than 250mm lengthwise).
- Twist Mode: If one placement head has a problem or parts have run out on one side of the feeder, the part placement can be done by another head, allowing continuous production without stopping the machine.

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**High Speed Flexible Mouter SM411F**

SM411F is a high speed component placer for placing odd shaped parts, which is equipped with the platform (dual gantry) of SM411, which is a chip shooter, and the vision system of SM421. It can maximize the production speed of odd shaped parts by up to 150% ~ 200% compared to that of SM411. In addition, the accessories including side tray and automatic flux dipping unit were improved and the operational convenience was enhanced by installing front/rear auxillary tower lamps. It is also applicable to POP.

**Features**
- Placement Speed: Chip 38K CPH (IPC9850) / SOP 23K CPH (IPC9850) / QFP 5.5K CPH (IPC9850)
- Applicable Parts: Max. 0402 ~ 1440 x H=12mm
- Placement Accuracy: ±50 μm(Max) ±3Sppm
- Applicable PCBs: L310 x W300 x 1lane (Standard) / Max. L140 x W420 x 1lane
New Smart Platform

**Advanced Flexible Mouter SM421**

The SM421 can be applied to parts from 0603 microchip to 22mm IC part through On-The-Fly recognition technology, which is Samsung’s proprietary technology that realizes the placement at the highest speed among medium speed chip mounters. It also allows recognition of parts with fine pitch at 0.4mm with 0.4mm pitch by adopting a mega pixel vision system for the Stage camera. It allows IC parts to be placed with high accuracy of 30 microns. It also easily registers parts of complicated shape by supporting the polygon recognition algorithm.

**Features**
- Placement Speed: Chip 21K CPH (IPC9850) / QFP 5.5K CPH (IPC9850)
- Applicable Parts: Max. 0402 ~ 55mm (Part height H=15mm)
- Placement Accuracy: ±50μm/Chip, ±30μm/QFP
- Applicable PCBs: L460 x W400 x 1Lane (Standard) / Max. L740 x W460 x 1Lane

**Powerful Vision Algorithm**
- The SM Series increases recognition accuracy by removing component image noise function and implementing an automatic teaching function. The flying camera helps recognize and compensate for components such as chip, TR, BGA and QFP as they are picked up and transferred to the placement point. Productivity and economic efficiency are improved with a new function that recognizes the position of the tape pocket from which the component is picked up.
  - Split Recognition for Large Component
    - ±25mm BGA (1.0mm Ball Pitch) / Connector, 72mm long in the diagonal direction / Using 45mm FOV stage camera
  - Real-Time Automatic Pickup Position Compensation

**Polygon Function**
- The polygon recognition function was added to reinforce the applicability of odd shaped parts. The polygon recognition function, which extracts the part shape and recognizes the shape of the part entirely, provides optimal solution to the placement of irregular shaped SMD parts.

**High Precision, Multi Function Component Placer SM451**

The SM451 is a high precision multi-functional chip shooter equipped with a high precision force control head based on the SM421 platform. It applies a linear scale to the Y axis to improve placement accuracy. Basically, it can be applied to various odd-shaped parts from 0402 tiny chips to ≤21 x 42 mm IC parts, long connectors, bare chips and PIP insert parts. In addition, it also allows placement of special parts by providing gripper nozzles and supports the functions for part height adjustment of up to 28mm, applicability to POP, lead lift-off check, and rear side reflection recognition.

**Features**
- Placement Speed: Chip 8.5K CPH (IPC9850) / QFP 4K CPH (IPC9850)
- Applicable Parts: Max. 0402 ~ 57 x 42 mm IC parts, long connectors, bare chips and PIP insert parts
- Placement Accuracy: ±50μm/Chip, ±25μm/QFP
- Applicable PCBs: L460 x W400 x 1Lane (Standard) / Max. L610 x W460 x 1Lane

**Reinforced Applicability to Odd Shaped Parts**
- In order to reinforce the applicability to odd shaped parts, the function for lead lift-off check using gripper nozzle and laser sensor as well as the functions for rear side reflection recognition and PIN recognition for PIP insert part placement are added.

**High Precision Force Control System**
- Allows the placement of parts requiring precision placement at the Z axis, such as PIP insert parts and flip chips, by applying the Z axis force control system controlling the force widely from 0.1N to 50N.

**Applicable to Special Package**
- As equipment for special part placement, it is applicable to POP.

**New Head**
- 4 Spindles 45mm Pitch

From micro chips for mobile devices to large boards for display - SM400 series machines provide optimum placement solutions to various needs of customers through the super-high speed On-The-Fly placement mechanism and the vision system with high reliability.
New Smart Platform

Longer Mean Time Between Assists (MTBA)
Fixed, high-quality equipment, such as non-stop tape feeders, increase overall system reliability and help significantly reduce amount of machine downtime.

Non-Stop Tray Feeder
JEDEC-type cassette are separated into upper and lower magazines, each having 12 pallets and can operate independently. Tray components also can be reloaded while the machine is running, enabling consistent non-stop operation.

Side Tray Feeder
Entire JEDEC trays can be presented to the machine without any impact on PCB process width or available feeder slot locations, allowing for direct pick-up from tray and maximum efficiency of feeder space.

Non-Stop Tape Splicing
Provides a continuous, steady supply of available components quickly and easily using a component tape connecting splicer.

Quick Changeover
New Non-Stop Tape Feeder
Improved Accuracy
- High feeder base stability
- New mounting mechanism
- Two-position control pins at the front side
- Newly designed sprocket
- Stable Indicating
- Built-in cylinder
- Optimized pressure control within the cylinder
- Increased pick-up speeds with the index sensor
- Tape guide automatically compensates for changes in tape thickness
- Variable tape support (for feeders accommodating tape widths of 12mm and higher)

Easy to Use
- Swinging type reel hanger (splicing/verification)
- Easy feeder identification by applying a different color for each clamp 8mm(0402, 2p, 4p), Large Size(12~88mm)
- Ergonomic handle design
- Manual index switch (IT option)
- Power supply indication lamp illuminates when fixed by the clamp
- Tape guide lift prevention through the use of the control pin

Collective Feeder Replacement System — Docking Feeder Cart System
Samsung’s Docking Feeder Cart System is the key to rapid changeover. A Docking Feeder Cart can be loaded offline, and then quickly rolled up to the machine where it is pneumatically clamped to the feeder base. Both the front and rear sides of the SM Series machines are designed to accommodate the Docking Feeder Cart System.
- Significantly reduce changeover time
- Replace carts without halting production
- Accommodates up to 56 8mm feeders per cart
- Automatically connects to feeder power and air supply
- Easily set the cart height using adjustable feet

Minimal Model Changes — Feeder placement Commonization
Register up to 120 8mm feeders on one machine simultaneously. Concurrent optimizer support for 1 to 5 programs allows for multiple models to be arranged at the same time. The sliding-type feeder system permits the user to remove and replace feeders during operation without interrupting the overall system.

Changeover Report
The SM series can automatically generate a Job Change Order Sheet (feeder changeover report) while running production in order to minimize setup time. This report identifies only the feeders that need to be changed, eliminating the need to completely reload the machine.

Automatic Width Adjustment
The board transport system automatically adjusts to the precise board width in order to further facilitate quick changeover.

Common Nozzles
SM Series systems use nozzles that are common to other Samsung SMT assembly systems, allowing for interchangeability and optimal line balancing. With the increase in popularity of more delicate micro components, SM series systems have incorporated features to handle the demands of such products, specifically using nozzles with compliant mechanisms in order to prevent component damage.
- Ceramic Nozzle
- Bare Component Soft PAD Nozzle (Optional)
SMN Tape Feeder
- Feeder Types/Sizes
  - 8mm (HD)
  - 8mm (2P)
  - 8mm (4P)
  - 12mm
  - 16mm
  - 24mm
  - 32mm
  - 44mm
  - 56mm
  - 72mm
  - 88mm
- Feeder Pitch (mm)
  - 2
  - 4
  - 8
  - 12
  - 24
  - 32
  - 40
  - 48
  - 60

Non-Stop Tray Feeders
- STF100D (Shuttle Tray Feeder)
  - Has upper and lower magazines with 12 pallets each, allowing the part tray to be replaced without stopping the chip mounter during part placement.
  - Requires tray feeding assembly for various odd shaped parts.
  - Feeds 24 trays with 24 stages (1 tray / 1 pallet)
  - Feeds 48 trays with 24 stages (2 trays / 1 pallet)

SM Single-Layer Tray Feeder
- One-touch mounting allows the tray to be easily inserted and removed from feeder base.
- Tray installation surface enables high speed pickup.
- Multiple orientations, based on tray dimensions.
- Applicable Trays: 2”, 3” x 3.16, 200 x 316mm, 272 x 316mm
- Type: Single layer tray feeders (336 x 316mm) with 2 trays

SM Feeder Docking Cart
- Significantly reduce changeover time using the SM Series Docking Feeder Cart System. The system allows for replacing a complete feeder configuration in just minutes.
- Basic Set Configuration
  - Docking Feeder Base
  - Docking Cart

SM Feeder Storage Rack / Feeder Exchange JIG
- Minimize the space required to store unused or staged SM feeders.
- SM feeder storage rack with 100 slots provides storage capacity for up to 100 SM feeders (based on 8mm feeder).
- SM Feeder storage rack with 20 slots and the Feeder Exchange JIG provides storage capacity for up to 20 SM feeders (based on 8mm feeder).
- Allows the user to change tape reels in front of the machine, thus preventing feeder damage and improving work efficiency.

SM Single Layer Tray Feeder
- Type: Single layer tray feeders (336 x 316mm) with 2 trays

Feeder Splicing Tool Set
- Provide a continuous, steady supply of available components to increase productivity and reduce machine downtime.
- Manual Tape Splicing Tool
  - Portable Tape Splicing Tool
- Performs the tape connecting function that guarantees high quality by moving the tool in front of the machine.

ELITE System
- Off-line Part Library Teaching
  - Minimizes the loss due to the shutdown of the machine when performing new part and special part library teaching.
  - Reduces setup time for a new model.

SM Feeder Calibration JIG
- Verify and adjust the feeder tape pocket position with the SM Series Feeder Calibration JIG as part of a scheduled system maintenance program to ensure reliable component pickups.
New Smart Platform

Intelligent Feeder System

The IT feeder system that provides an integrated part misplacement prevention function and automatic part recognition function automatically recognizes the feeder while exchanging the feeder to avoid in advance the possibility of the part loss due to incorrect placement and incorrect insertion or the mistake of the operator. In addition, it allows efficient material management by checking the remaining part quantity by storing the part information in the database.

Tools to prevent Incorrect Component Placements

- The component shortage warning feature prevents component shortages in real-time during machine operation. This feature minimizes machine downtime by allowing the operator to replace components in advance so as to not impact production.
- Monitor remaining quantity for each component tape reel
- Alerts the user that a component shortage is imminent

Low Component Supply Warning

The EasyOLP Suite is a comprehensive management tool for the SMT line developed by Samsung Techwin. Since it performs job history management, converts various CAD or ASCII data into placement data for the chip mounter, and implements the line balance with optimum conditions between machines, the time required for programming can be minimized and the work program can be optimized to suit the environment of the machine, maximizing the productivity and increasing the production efficiency through machine monitoring.

Creation of Optimum On-Line Work Program for Chip Mounter

The EasyOLP Suite whole system structure
<table>
<thead>
<tr>
<th>Model Name</th>
<th>SM431</th>
<th>SM431L</th>
<th>SM411</th>
<th>SM411F</th>
<th>SM421</th>
<th>SM461</th>
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</thead>
<tbody>
<tr>
<td>Number of Spindles</td>
<td>8 Spindles x 2 Gantry</td>
<td>8 Spindles x 2 Gantry</td>
<td>8 Spindles x 2 Gantry</td>
<td>8 Spindles x 2 Gantry</td>
<td>6 Spindles x 1 Gantry</td>
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<tr>
<td>Placement Rate (IPC9850)</td>
<td>Chip 1608</td>
<td>Chip 1608</td>
<td>Chip 1608</td>
<td>Chip 1608</td>
<td>Chip 1618</td>
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<tr>
<td>Placement Rate (Based on the standard chips)</td>
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<td>Component Range</td>
<td>Chip / QFP</td>
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<td>Board Dimension (mm)</td>
<td>120mm x 120mm</td>
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<td>Feeder Capacity</td>
<td>42,000 CPH</td>
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