Printing, Dispensing, Reflow, Cleaning and Thermal Processing Equipment

Designed for Semiconductor Yield Improvement
Together in process perfection

ITW EAE brings together the world-leading brands of electronics assembly equipment. Brands with reputations for advancing process perfection. The combined knowledge and experience of the ITW EAE group is driving further innovation and speeding the development of next generation technology. New technology that can dramatically improve productivity and yields while reducing maintenance and cost of ownership.

MPM | Camalot | Electrovert | Vitronics Soltec | Despatch

In-lined manufacturing for faster delivery

ITW, and all of its divisions, are afforded the opportunity to leverage highly refined manufacturing practices that have improved our factory and supply chain operations. This has significantly increased our shipment velocities, allowing us to deliver industry leading lead-times and responsiveness.

Process optimization, training and 24/7 support

We are committed to high-quality products backed by application and process expertise. After installation we will help optimize your equipment for maximum performance over its lifetime. We offer operator training, equipment protection and preventative maintenance programs to ensure 24/7 machine availability. We provide on-site technical support, remote diagnostics, telephone support and quick access to spare parts.

OpenApps™ for Industry 4.0 interfaces

The operating systems in most ITW EAE equipment feature open architecture source code which provides customers and third parties the capability of developing custom interfaces in support of Industry 4.0 initiatives and communication with Manufacturing Execution Systems (MES).
Advanced packaging and component miniaturization are putting increasingly complex demands on semiconductor manufacturing that pushes the limits of electronic assembly equipment. Developments in flip chip packaging, advanced fan-out packages (FOWLP), System in Package technologies and 3D stacking are being developed to meet next generation market requirements.

ITW EAE plays a major role in semiconductor packaging, including stencil printing solder bumps, dispensing underfills and encapsulant liquids, thermal processing die attach adhesives, cleaning before and after wire bonding, solder ball reflow and more. ITW EAE works with the world’s leading semiconductor manufacturers in developing equipment that addresses evolving technical challenges while also meeting the need for higher throughput, yield and performance.
Component miniaturization in the semiconductor market challenges printing equipment with micro-thin stencil apertures and ultra fine pitch. Stencil printing for advanced semiconductor packaging applications such wafer bumping, CSPs, BGAs, flip chips and SIPs has been proven as an effective, low cost solution. The MPM® Edison™ meets these challenges with proven print process capability greater than 2 Cpk for 0201 metric components. The Edison is the most accurate printer in the market. With a built-in ±8 micron machine alignment, and ±15 micron wet print accuracy (≥2 Cpk @ 6 sigma, Edison’s wet print accuracy is 25% better than the next best printers.

The most accurate printer in the market, with advanced technology needed for ultra fine pitch and micro aperture printing processes

**Best Performance Closed-loop Squeegee**

MPM Edison is optimized for ultra-fine pitch printing with a transfer efficiency that exceeds requirements for the smallest apertures. A single high precision load-cell with closed-loop pressure control and motor driven system enable precise and consistent squeegee force control across the entire print stroke in both directions, which helps improve yields especially for challenging thin substrate and stencil printing applications such as semiconductor back-end packaging.

**Optimized Coplanarity**

Innovative machine design achieves ultra-tight coplanarity between stencil and substrate enabling yield improvement for ultra-thin stencil printing.

**Venturi Adjustable Vacuum System**

The optional venturi high-flow vacuum system holds thin substrates securely and flat against the stencil which ensures and even more consistent print quality.
Designed for Semiconductor Yield Improvement

**NEW Paste Height Monitor**
The Paste Height Monitor combines advanced software and sensor technology to accurately monitor the paste bead for volume consistency. Upper and lower limit roll-height monitoring eliminates insufficient or excess paste volumes. It is a non-contact solution that can automatically add more paste to the stencil as it is needed.

**Highly Effective Wiping**
A super-size 65m paper roll with patented constant paper tension control, makes 10,000 prints possible before a roll change is needed, reducing downtime and operator interface. Wiping zone is isolated from printing zone to avoid cross contamination.

**Unmatched Speed and Throughput**
The Edison has a total throughput that is much faster than current leading printers due in part to the highly-efficient parallel processing of the stencil shuttle system, stencil wiping, and vision alignment system.

Faster cycle time leaves room for extra steps that improve the quality of semiconductor packaging. Slower stencil separation for optimal print definition, more frequent wiping and a double print stroke after wiping all lead to improved quality and yield.

**Board Staging**
Board staging enables three boards in the machine simultaneously. Boards are pre-loaded during the print process resulting in reduced transfer times and improved cycle time.

Key Values of MPM Edison for Semiconductor Manufacturers

- The most accurate printer in the market
- >2Cpk process capability for 0201 metric
- **Optimal coplanarity**: Innovative machine design achieves ultra tight coplanarity between stencil and substrate
- **No print deviation**: Single load-cell closed-loop squeegee-force control eliminates front-to-back variation and maintains the set force across the entire board surface
- **Highly effective stencil wiping**: Patented paper tension control
- **Contamination free print area**: Separate wiping and printing zone prevents cross contamination
- **Secured thin substrate for consistent print quality**: Venturi adjustable vacuum system
- **Consistent printing quality and stencil protection**: Large, flat blade-landing zone
- **Minimized changeover**: Super-size 65m paper roll
- **Adaptable down to 18-inch stencil**: Adjustable stencil shelf and adapter
- **Small footprint**: Compact design
- **Industry 4.0 connectivity**: OpenApps for customizable MES communication interface
Camalot offers high-speed, extremely accurate dispensing of underfill and encapsulation molding, epoxy adhesives, polymers, photoresist, and flux. Speed, stability, and precision are hallmarks of Camalot® Prodigy™ automated dispensing systems. Bedrock stability and advanced ‘jetting’ techniques enable the highest level of precision for semiconductor packaging applications. The platform design is Semi S2/S8 compliant and can also meet Class 1000 cleanroom requirements by request.

Innovation, performance and flexibility designed to meet the needs of semiconductor manufacturers.

**HIGH-SPEED AND EXTREMELY ACCURATE DISPENSING**

The Camalot® Prodigy™ dispenser is designed and built to deliver high-speed, extremely accurate dispensing. Advanced linear-drive architecture, combined with exceptional frame stability enables greater precision at higher speeds, resulting in consistently higher yields. The Camalot Prodigy boasts a +/- 35µ 3 Sigma dot placement accuracy at full speed.

**PRODIGY DUAL LANE**

For increased productivity, a dual lane platform is available in a compact 830mm wide 4-zone system or the larger 1270mm 6-zone system. Independent lane width adjustment provides the ability to process a wide range of product sizes up to 400mm x 254mm.
**IR Temperature Sensors**
A constant product temperature through the dispense process is critical to ensure process stability and repeatability for underfilling of high I/O count devices such as BGA’s, Flip Chips. The new patent-pending IR (Infrared) Temperature Sensors measure in “real time” the top-side board temperature which allows the system to provide closed-loop control to maintain the product within the specified temperature range. Temperature is monitored through pre-heat, dispense heat and post-heat zones.

**Automatic Digital Vision Alignment**
Powerful optics and processing algorithms allow for sub-pixel definition maximizing the capability for locating fiducials, and components/pad edges. Fiducial images are taught and saved to an onboard library; in addition, it works as an image recognition system so that any unique feature can be used for alignment. Camalot’s edge detection vision alignment is the fastest and most accurate positioning method available. A one-snap operation finds all four edges of a die up to 25mm square, and automatically adjusts needle path for variations in X, Y, and theta placement, die width, and edge parallelism.

**Dynamic Dual Head (DDH)**
The first and only dual head system that automatically corrects for part to part inconsistencies. This patented technology dramatically increases productivity with no sacrifice to yield and is compatible with jetting and needle-based pump technologies. The DDH option uses an innovative mini XY drive system on a second Z-Axis to correct in real-time any part to part variances.

**NuJet™**
“Compact, Fast and Flexible”, NuJet eliminates the use of a needle and incorporates a state-of-the-art pneumatic actuator that generates an operating frequency of up to 300Hz. Controlling the piston with a pneumatic actuator and closed-loop software achieves a high degree of accuracy and repeatability for consistent process results. With a slim-line design and low mass the pumps can be pitched down to 28mm apart for optimal dual-head dispensing.

**NanoShot™**
NanoShot™ offers high speed - up to 600 Hz, and ultra-fine resolution, with dot sizes < 300 microns, this patent pending pump features state-of-the-art motion control technology, simple maintenance and quick changeover.
A forced convection oven is needed for reflow of ball mounts (bumping). Nitrogen atmosphere is used to reduce oxidation of the surfaces and minimize voids in the interfaces. Electrovert reflow soldering ovens are designed to deliver excellent thermal performance combined with process capability and control. Electrovert sets the standard in innovative technologies that save on the lowest power and nitrogen consumption rates. Electrovert’s closed-loop nitrogen control feature provides an automatic approach to maintaining and controlling PPM levels within the reflow zones. Closed-loop nitrogen control has the potential to significantly reduce nitrogen consumption, especially in high-mix low-volume production environments.

**IsoThermal™ Chamber Technology**

The OmniES and OmniMax reflow systems series are designed to deliver maximum thermal performance combined with process capability and control. The heartbeat of the OmniES/Max series — Electrovert’s patented IsoThermal Chamber Technology (ICT). IsoThermal Chamber Technology innovative design consists of dual compression boxes, independent blower speed control, super efficient heating elements, and utilizes a low-turbulent convection delivery type diffusers. The result: super-efficient thermal performance throughout the entire process.

**Innovative Cooling Technology**

- Air flow dynamics within cooling zones are efficiently controlled for a balanced environment and reduced exhaust temperatures
- An industry first with dripless cooling significantly reduces the potential for flux dripping in the cooling area
- Excellent separation between the heating and cooling areas produces tight control of TAL
- Enhanced nitrogen cooling design achieves maximum airflow balance and reduces nitrogen consumption by 20 to 25%
The most advanced technology in the industry

**OMNIES 5, 7, 10, AND 13 ZONE REFLOW SOLDERING AND CURING**

The OmniES offers a combination of innovation and industry-proven technologies in an easy-to-use, reliable oven for reflow soldering and curing applications. The OmniES includes independent blower control as standard. The OmniES series are available in hybrid or full convection models (full convection is field upgradeable). Through energy saving designs, the OmniES models are ideal for the majority of reflow applications. The OmniES delivers excellent thermal performance at the lowest cost of ownership.

**MAINTENANCE REDUCTION TECHNOLOGIES**

- Patented dripless cooling design extends maintenance in the cooling section and easy to clean
- Patented Intelligent Flux Control (IFC) incorporates self-clean features and allows for full maintenance during production
- Full accessibility to all major addemblies is accomplished through removable panels (front and back)

**VERSATILE CONVEYOR SYSTEM**

- The versatile conveyor system is capable of process widths up to 40” (1016 mm)
- Linear guides and precision screw shafts ensure a smooth motion and highly repeatable conveyor width
- Robust conveyor design that is focused on minimizing vibration
- Center Board Support (CBS) option
- Multi-lane solutions are compatible with all major pick-and-place suppliers

**OMNIMAX 7, 10, OR 13 ZONE REFLOW SOLDERING**

The OmniMax offers precision IsoThermal convection for demanding thermal profile requirements and is ideal for applications that require precise control of convection dynamics within each zone. The OmniMax has independent speed and temperature control between top and bottom within each individual zone as standard.

**HIGH-END FEATURES**

- User-friendly Windows®-based user interface with expanded data logging capabilities
- Common PC and I/O system with wave and cleaner products
- Independent closed-loop blower control (heating and cooling)
- OmniCheck™ continuous monitoring and verification feature
- Comprehensive list of features that support demanding production requirements.
Electrovert cleaning equipment plays a critical role in semiconductor fabrication and are utilized in multiple steps, including degreasing, cleaning prior to electroplating and underfill, cleaning after bumping and wire bonding, and carrier debonding of fan-out packages. Cleaning helps to remove flux residue, excess adhesive, grease and oils to ensure proper bonding and material distribution and avoid defects and increase yields. Electrovert cleaners are designed to deal with small, lightweight semiconductor products such as lead frames, BGAs, wafers and 3D stacked packages.

**Mixed Spray Technology**

The clear advantage of the Aquastorm cleaners is the ability to deliver a dynamic combination of chemistry, thermal, and mechanical forms of energy at the surface to effectively clean under low stand-off and difficult to clean components. Aquastorm utilizes mixed spray technologies including high-impact force for tight spaces, oscillating action for low pressure applications and complete flooding action for high pressure applications. Jet Impact Cleaning with omni-directional spray patterns greatly improves cleaning under low-standoff components, and eliminates shadowing effects. Chemical Isolation provides optimal process separation and minimizes chemistry consumption.

**Torrid Zone Drying Technology**

Integrated into the machine cabinet, the Torrid Zone delivers a controlled dynamic process that effectively removes moisture. Typical performance includes drying complex assemblies to within 0.1 gram of prewashed dry weight. The technology reduces exhaust requirements by 44% and uses 15% less power than conventional drying systems.
Electrovert® AQUASTORM® SERIES

Electrovert Aquastorm is a versatile, high-performance cleaning system designed to optimize your cleaning process while minimizing overall cost. Precise spray pressure control for sensitive components and semiconductor applications. Both the Aquastorm 100 and 200 are ideally suited to RMA and no-clean de-flux applications that require chemistry, as well as removal of water-soluble organic acid flux. It is also available in stainless steel model.

Electrovert® AQUASTORM® 60

Aquastorm 60 in-line cleaning system is ideal for semiconductor cleaning applications in which the manufacturing volume has outgrown the capability of a batch type cleaner and/or lack the floor space requirements of a typical in-line cleaner. For straight DI aqueous cleaning applications the total length is 6’9” (2103 mm) and for chemistry based applications the total length is 9’3” (2844 mm).

MicroCel™ CENTRIFUGAL CLEANING SYSTEM

The MicroCel cleaner uses centrifugal energy for unparalleled penetration, solubilization and containment removal for advanced packages including flip chips, MCMs, SIPS, BGAs, CSPs, and hybrid electronics.
Despatch ovens provide clean process, low oxygen, fast cycle curing of adhesives and polymers used in high-volume semiconductor packaging and assembly. Despatch ovens have superior temperature uniformity of ± 0.5% of setpoint and offer SEMI S2/S8, CE, and SECS/GEM communication. Low particulate environmental controls protect from contamination and low oxygen levels prevent oxidation. Despatch ovens are used for adhesive bonding and curing, encapsulant curing, underfill curing of CMOS optical sensors, die attach and BGA, B-stage adhesive curing, polyimide curing, metallic thin film annealing, and photoresist curing.

Clean process ovens designed for polyimide baking and curing applications

The Despatch PCO2-14™ electrically heated oven was designed to meet the specific process requirements for hard baking polyimide coatings in an inert atmosphere. This high-performance, clean process oven (ISO Class 5/Class 100 recirculated airflow) offers many unique components, including a pressure relief system, an oxygen control system and a process monitoring system which allows the oven to achieve the strict oxygen level and atmospheric requirements involved in polyimide curing.

**Pressure Relief System:** In the "hard bake" polyimide cure process, residual solvent is removed and desired surface properties are finalized. The process of removing solvents requires that the oven contain equipment to help prevent and collect solvent condensation. Despatch designed the PCO2-14™ with a pressure relief system that includes a removable "cold trap", an easy-to-clean condensate trap that helps to prevent polyimide buildup in the oven’s exhaust.

**Oxygen Monitor and Control System:**
The PCO2-14™ is an inert atmosphere oven which allows the oxygen level to be maintained at 20ppm or less to help prevent oxidation of the polyimides being cured. The oven contains an O2 monitor which is wired to the purge valve and turns the nitrogen purge on whenever the oxygen level is above the O2 monitor set point. Once the nitrogen purge is complete, the O2 level is maintained at a set point by a controller that operates a modulating valve during the curing process. This process minimizes the nitrogen usage and allows for consistent and repeatable product curing.

**Process Monitoring System:**
The oven features Protocol 3™ software to allow for communication between the PC and the oven, an Ethernet connection and a 15” (38.1cm) flat panel display screen. The software communicates directly with the oven’s Protocol 3™ controller, O2 controller, O2 monitor and integrated PC to observe and data log entire cycles and provide the user with real-time information on set points, actual chamber temperatures and O2 levels throughout the entire process.