

## Product Details – Liquid Photo-Imageable Solder Mask Line

*Spray & tack-dry panels in less than 7 minutes without handling.*



*Make handling wet panels a thing of the past.*

Argus International spray technology has been proven superior to other methods of LPISM application. Our primary goal was to produce a spray system and a tack dry oven which could be linked through compatible conveyor systems to form a time and labor-efficient unit and to **eliminate the handling of wet boards**. A single, traversing spray head also increases efficiency by reducing setup time, and decreasing both machine cost and maintenance. HVLP-Heated Gun Technology allows use of high-solids LPISM for increased efficiency and minimized environmental impact.

Argus drying technology provides a major breakthrough in reduction of tack dry time. Typical convection systems require 35 to 45 minutes to tack dry LPISM coatings; the 9724 3 Zone Tackdry Oven reduces this to 3 or 4 minutes and 9724 5 Zone Final Cure Oven reduces final cure time to 6 or 7 minutes.

The Argus International PC9000 Product Line, shown above, consists of a Double Sided LPISM Spray Application System and a 3 Zone Tackdry Oven.

The following table summarizes each:

Model	9524S Single Side	9524D Double Side	9724x3	9724x5
Function	LPISM Application	LPISM Application	IR Tackdry	IR Tackdry/Final cure
Major Feature	Heated Spray-Gun Technology	Heated Spray-Gun Technology	Under 4 Minutes Tack-Dry Time	Under 7 Minutes Final Cure Time
Throughput 24 x 24"	Up to 120 panels per hour			
Panel size 6-24 inches	24" wide by any supported length			

The following contains detailed information about the above equipment including performance and facilities requirements, as well as answers to common questions regarding both the 9524 Spray Unit and the 9724 3 Zone Tack-Dry Oven and 9725 5 Zone Final Cure Oven.

If you have any questions, or would like to observe sample PCBs being processed, please contact an Argus Technical Adviser.

Thank you for considering Argus International in your production plans; our technical resources are at your disposal to help you make the proper choice.

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### FLEXIBLE AND THIN CORE MATERIAL CARRIER FRAMES 9524 SPRAY SYSTEMS AND 9724/9224 TACKDRY/FINAL CURE OVENS

#### **Background:**

When materials are not able to support themselves from its edges, while enduring an air pressurized force of up to 60 PSI [4.1 bar] and high temperature settings of up to 250° C, the material will sag causing it to fall out of the conveyor of the Spray System, and the material will make contact with the conveyor Flites of the Tackdry/Final Cure Oven creating undesired marks in the LPSM.

#### **Flexible Material Carriers:**

Flexible Materials range in thickness under 10 mils. A carrier has been developed to support materials unable to support themselves as mentioned in the **Background** equipment conditions. The carriers are a four piece assembly consisting of a 16 gauge [1.5mm] lower frame with registration pins, an 18 gauge [1.2mm] upper frame and two retaining clips which hold the two frames and the flexible material all together, and the complete carrier is made of 304 grade stainless steel. The stainless steel construction makes the carriers sturdy and easy to clean because of its chemical resistance to corrosion. These carriers can come in many sizes. The maximum overall width of the flexible material cannot exceed more than 23" [584mm], but the length of the material has no limits.

#### **Flexible Material (thickness ranging under 10 mils):**

The material being used must have a minimum of a 1" [25.4mm] border around its useable area. This way the carriers have places to where they can hold this material without the material slipping out or tearing out of the carriers. The frames will be 1.25" [31.75mm] wider and longer than the overall width and length of flexible material you are processing. Four to six or more, depending on length, .125" [3.175mm] diameter holes will need to be punched into the flexible material matching the registration pins of the Lower Frame.

#### **Thin Core Material Carriers:**

Thin Core Materials range in thickness between 10 - 21 mils. A carrier has been developed to support materials unable to support themselves as mentioned in the **Background** equipment conditions. The carriers are a four piece assembly consisting of a 16 gauge [1.5mm] lower frame with registration pins, an 18 gauge [1.2mm] upper frame and two retaining clips which hold the two frames together, and the complete carrier is made of 304 grade stainless steel. The stainless steel construction makes the carriers sturdy and easy to clean because of its chemical resistance to corrosion. These carriers can come in many sizes. The maximum overall width of the Flexible material cannot exceed more than 22" [558.8mm], but the length of the material has no limits.

#### **Thin Core Material (thickness ranging between 10 - 21 mils):**

The material being used must have a minimum of a ½" [12.7mm] border around its useable area. This way the carriers have places to where they can hold this material without the material slipping out or tearing out of the carriers. The frames will be 2.25" [57.15mm] wider and longer than the overall width of material you are using. Four to six or more, depending on length, .125" [3.175mm] diameter holes will need to be punched into the flexible material matching the registration pins of the Lower Frame.

#### **Test Results:**

Several tests have been made using similar, but different styles of frame designs, and the testing for each style produced results in order to make judgments on how the flexible materials need to be handled under the equipment conditions as mentioned in the **Background**. What the results show are that the flexible material must be held .25" [6.35mm] around the border, registering pins in the lower frame are needed to properly place the material consistently in the same position, the top frame aids in the holding of the flexible or thin core material, it also prevents the flexible or thin core material from coming off the registration pins, and the side clips secure both upper and lower frames together making an easy assembly and disassembly of the carriers. The side clips are made with several cutouts to improve any fluid evacuation and drying through out its channel. The final results produced successful conveying of the assembled carriers, and were tested using the Argus PC5520 Precleaner, the 9324, 9424 and 9525 Spray Systems, and the 9624 and 9724/9224 Tackdry/Final Cure Ovens.

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### Argus 9524 Spray System



The 9524S (Single-sided) or 9524D (Double-sided) HVLP Spray Units utilize advanced spray technology to apply uniform LPISM coatings to Printed Circuit Boards. This is accomplished by sweeping the heated gun across the PCB at very high speeds as the PCB passes through the spray chamber on a continuously moving edge-contact conveyor. This provides an efficient, reliable system which minimizes over-spray and produces a continuous, conveyORIZED throughput of LPISM-coated boards.

The 9524S deploys one spray gun for spraying a single side of the panels at a time, while the 9524D deploys two spray guns for the single-pass coating of both sides of the panels.

#### Key Benefits:

- Heated gun technology has improved the ability of HVLP systems to encapsulate traces, because the LPISM returns to room temperature and higher viscosity before it strikes the PCB. The heated gun also reduces LPISM usage by allowing thinner coatings to adequately cover higher circuit traces.
- Typical spray operation will provide 140 to 150 square feet of a 1 mil thick dry coating per kilogram of LPISM; this easily equals or exceeds the efficiency and economy of other methods of application.
- Simplicity of setup, speed of operation and uniformity of performance all favor the use of a single spray gun system. This system is not subject to multiple gun spacing, placement, adjustment and pattern problems that can all lead to inconsistent coating thickness.
- English Language with English Units comes standard with the touch screen controls. Upon customer's request, English Language with Metric Units is available as an option, and a secondary language can be installed with English Language with Metric Units; such as, Chinese, Danish, German, Italian, Russian and Spanish. Other secondary languages can be available upon customer's request.
- Machine can be CE compliant upon customer's request.

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### Argus 9724 IR Tackdry and Final Cure Ovens



The 9724 IR Tackdry Oven is designed to quickly and efficiently tack-dry LPISM-coated Printed Circuit Boards. The unit consists of three individually controlled long-wave infrared heater zones, a forced-air circulation system, and a conveyor to move the boards through the oven. This highly innovative technology, developed by Argus International, provides a breakthrough in significantly reducing the tack-dry time of LPISM-coated PCBs. While convection-only ovens rely on air to transfer heat, the 9724 directly heats the board with IR radiation and provides forced air circulation. This technique lowers the normal tack-dry time from 35-45 minutes to 3-4 minutes, which represents about a 1200% improvement in drying efficiency!

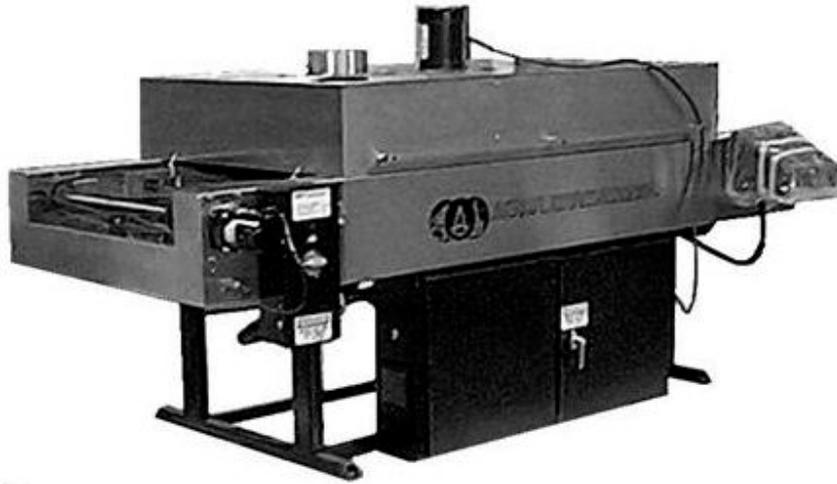
#### Key Benefits:

- Traditional convection ovens use electric coils to heat the air; the air moves around and heats the coating; eventually the coating heats the substrate. Once the substrate gets hot enough to not heat-sink the coating, the coating dries from the outside.
- The Argus IR Tackdry Oven employs 5 to 8 micron IR emitters that directly transmit energy to the densest material, in this case the PCB. Because the air and coating are between the emitter and the PCB, some residual heating occurs, but the bulk of the energy is absorbed by the PCB. This means that the coating predominantly dries from the inside; that is, the junction between the PCB and the coating, thus increasing the drying rate while reducing skin formation and solvent retention. Forced air circulation in the 9724 then rapidly removes the evaporated solvent from the PCB surface.
- Most LPISM manufacturers can supply coating materials that function well in the 9724. Sun Chemical, Electra, Enthone, J-Kem International, Lackwerke Peters, Tamura, Technic, and Taiyo all produce LPISMs that have processed well in our laboratory evaluations. Potential customers are welcome to view the IR Tackdry Oven in operation or to process sample boards in our Technical Service Laboratory.
- The real benefit to acquiring the complete PC9000 LPISM Application System is that it allows the machines to be linked together so that LPISM application becomes a load-unload operation, **without handling of wet boards**. By placing equipment end to end, boards may be loaded at the entrance of the 9524 Spray Unit and removed at the exit of the 9724 Tackdry Oven just minutes later, fully coated and tack-dried.
- With the PC9000 System, conveyor speeds of 4 feet per minute are realistic as are throughputs of up to 160 boards per hour for 18" x 24" samples. This gives excellent production rates and provides economic benefits.
- Optional additional set of two heater zones to form a five zone Final Cure Oven.
- English Language with English Units comes standard with the touch screen controls. Upon customer's request, English Language with Metric Units is available as an option, and a secondary language can be installed with English Language with Metric Units; such as, Chinese, Danish, German, Italian, Russian and Spanish. Other secondary languages can be available upon customer's request.
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### Argus 9224 Fast IR Curing Oven



The Argus 9224 Fast Cure Oven was designed to meet the requirements of the fast turn prototype PC manufacturers where the need to reduce manufacturing times is critical. Unlike the larger 9724X5 Final Cure Oven, the 9224 occupies less space on the production floor being only 110 inches long. The 9224 also has a much smaller production rate than the 9724X5, typically operating at about 2.5 fpm.

Argus International has been the leader in IR technology since the late 1960's, holding critical patents on IR fusing. No company has the experience of Argus in employing this technology to the PCB industry. Various Argus systems have utilized both short wave and long wave IR radiation, forced convection, and even UV radiation.

The 9224 has three separately controlled zones for curing. It utilizes both forced convection and long wave IR emitters. Using short wave IR emitter panels as opposed to the longer wave bulb design, there is both greater penetration and no need to replace bulbs. The panel life is typically measured in years and gives a consistent radiation over this very long lifetime. After extensive research we found only by adding forced convection to the oven, temperature disparities between the laminate and metal could be reduced. Although IR is a very uniform method of heating, circuit boards are not a uniform object to heat because of the different densities of copper and prepreg.

#### Key Benefits:

- The 9224 was designed with simplicity for long term trouble free operation and minimal maintenance. Should a repair be needed, it can be accomplished quickly and easily. The construction is robust, using a stainless steel heating chamber. An optional cooling module is available and more sophisticated controls including bells and whistles are available if required.
- Simple to operate and maintain, robust construction for the long term, excellent control, inexpensive to buy and run, the Argus 9224 offers unparalleled value.
- Machine can be CE compliant upon customer's request.